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THESIS

MEASURING DISASTER PREPAREDNESS OF LOCAL EMERGENCY MEDICAL SERVICES AGENCIES

by

Ross W. Elliott

September 2010

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Emergency Medical Services (EMS) plays a key role in disaster response. Yet, determining how much preparedness is enough to achieve an acceptable level of preparedness is challenging. After conducting an extensive literature review, it is evident no nationally accepted method exists to evaluate an EMS system's level of disaster preparedness systematically.

Research was conducted to define the skills and equipment that local emergency medical services agencies (LEMSA) or a similar entity needs to perform strategic disaster response duties and identify performance indicators for measuring preparedness. Using an appreciative inquiry approach, surveys and interviews of EMS personnel from across the nation were conducted. Interview questions focused on the positive aspects of each response with an effort to understand what might be possible in future events. Research subjects had first-hand experience in managing the EMS response during a disaster. Multiple types and sizes of events were studied.

A framework for defining minimum standards for adequate disaster preparedness for LEMSAs is constructed, including core EMS disaster response roles; essential competencies; skills needed to perform the core roles; and tools or equipment used for core roles. Training strategies for developing experience, competencies, and skills are identified, and metrics listed for measuring the level of preparedness.

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MEASURING DISASTER PREPAREDNESS OF LOCAL EMERGENCY MEDICAL SERVICES AGENCIES

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ABSTRACT

Emergency Medical Services (EMS) plays a key role in disaster response. Yet, determining how much preparedness is enough to achieve an acceptable level of preparedness is challenging. After conducting an extensive literature review, it is evident no nationally accepted method exists to evaluate an EMS system's level of disaster preparedness systematically.

Research was conducted to define the skills and equipment that local emergency medical services agencies (LEMSA) or a similar entity needs to perform strategic disaster response duties and identify performance indicators for measuring preparedness. Using an appreciative inquiry approach, surveys and interviews of EMS personnel from across the nation were conducted. Interview questions focused on the positive aspects of each response with an effort to understand what might be possible in future events. Research subjects had first-hand experience in managing the EMS response during a disaster. Multiple types and sizes of events were studied.

A framework for defining minimum standards for adequate disaster preparedness for LEMSAs is constructed, including core EMS disaster response roles; essential competencies; skills needed to perform the core roles; and tools or equipment used for core roles. Training strategies for developing experience, competencies, and skills are identified, and metrics listed for measuring the level of preparedness.

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LIST OF ACRONYMS AND ABBREVIATIONS

DHS	Department of Homeland Security
DOC	Department Operations Center
EMS	Emergency Medical Services
EMTALA	Emergency Medical Treatment and Labor Act
EOC	Emergency Operations Center
FEMA	Federal Emergency Management Agency
FTS	Field Treatment Sites
GAO	Government Accounting Agency
GIS	Geographic Information Systems
HSPD-8	Homeland Security Presidential Directive Number 8
ICS	Incident Command System
LEMSA	Local Emergency Medical Services Agencies
MAC	Medical Alert Center
MARCER	Mid-America Regional Council for Emergency Rescue
MCI	Multiple Casualty Incident
MOC	Medical Operations Center
NASEMSO	National Association of State EMS Officials
NIMS	National Incident Management System
NPG	National Preparedness Guidelines
PPE	Personal Protective Equipment
RDMH	Regional Disaster Medical Health
RDMHS	Regional Disaster Medical-Health Specialist
SNF	Skilled Nursing Facility
USGS	U.S. Geologic Survey
WMD	Weapons of Mass Destruction

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I. INTRODUCTION

A. PROBLEM STATEMENT AND BACKGROUND

Disaster preparedness is a concept easy enough to understand but quite difficult to define as having achieved. Defining the extent to which an agency must be prepared for a disaster is elusive because a single definition of a disaster does not seem to exist. Of the various disciplines that have a role in responding to disasters, reaching consensus as to the definition of disaster within each discipline is rare. Attempts to define a disaster become even more complex across disciplines.

The mission of responding agencies vary by function, discipline, geography, and jurisdiction. Roles and responsibilities vary with each agency depending upon the type of emergency and the tasks being performed at each level in the organization. Understandably, different perspectives held by various responder agencies and disciplines produce varied opinions as to how to define a disaster and how to define preparedness. The White House defined preparedness as, "…the existence of plans, procedures, policies, training, and equipment necessary at the federal, state, and local level to maximize the ability to prevent, respond to, and recover from major events" (The White House, 2003). Although various definitions of preparedness may exist, it can be argued that a definition issued by the executive branch of the federal government is likely to contain a broad enough approach so that it is common to all jurisdictions in the nation. States and local jurisdictions often follow the federal government's lead regarding disaster preparedness.

States and local jurisdictions devote significant time, energy, and resources in developing disaster response plans and emergency management capabilities. Training is conducted to validate and incorporate the plans into accepted procedures operationally. Tabletop and functional exercises are periodically performed to validate the contents of plans, identify and mitigate weaknesses, and build skills of emergency response personnel. Actions taken by states and local jurisdictions related to disaster preparedness are often motivated by federal funding.

Grant programs through the U.S. Department of Homeland Security (DHS), and other federal sources, that are funneled through state governments and passed on to local governments, augment the ability to acquire equipment, tools, and training to be better prepared for disasters. Federal grant funds have been used to purchase specialized vehicles, safety gear, information technology infrastructure, communications equipment, develop plans, conduct training and exercises and so on to enhance the local government's capability to respond to many different kinds of natural or manmade disasters. As an example, several consecutive years of the Hospital Preparedness Program grants have provided hospitals in some areas of the nation the ability to care for a surge of some 50 additional patients per hospital that are anticipated during disasters (R. Elliott, 2009).

It can be argued that the grant programs have facilitated local jurisdictions' preparedness by acquiring goods and services that will improve the ability to respond to disasters (U.S. Department of Homeland Security, 2007, p. 2). It is presumed by local leaders that the grant-funded equipment, development of plans, and for example, the existence of a new emergency operations center (EOC) will enhance a jurisdiction's level of preparedness (Board of Supervisors, County of Kern, 2006). However, to what extent are states and local jurisdictions better prepared to respond to and address the consequences of a natural or man-made disaster?

The Emergency Medical Service (EMS) discipline plays a key role in disaster planning, response and recovery. According to the U.S. Homeland Security Department *Target Capabilities List*, EMS is fully or partially responsible for all of the following mission response areas: on-scene incident management, emergency triage and pre-hospital treatment, medical surge, medical supplies management and distribution, mass prophylaxis, and mass care and sheltering (U.S. Homeland Security Department, 2007). Yet, no nationally accepted methodology or process is in place to evaluate and measure an EMS system's level of disaster preparedness systematically. However, several methods have been proposed or tested. Following the 9/11 terrorist attacks in 2001, United States' preparedness became a higher priority. Homeland Security Presidential Directive Number 8 (HSPD-8) called for establishment of measurable readiness

priorities, standards, and metrics (The White House, 2003). The broad policy document advancing HSPD-8 is the *National Preparedness Guidelines*, and this document lists eight national priorities for preparedness. Priority number seven is, "Strengthen Medical Surge and Mass Prophylaxis Capabilities." (U.S. Homeland Security Department, 2007, p. 11) Considerable effort to develop the *Target Capabilities List* (U.S. Homeland Security Department, 2007, pp. 447–488) has been extended, and significant progress seems to have been made to define discipline-specific preparedness through the goals and objectives. However, more work in the medical discipline is needed. According to the Center for American Progress, the federal government must enhance partnership efforts with state and local governments, and, "make national preparedness an urgent priority, particularly public health and medical readiness" (Crowley, 2008, p. 52).

Federal Emergency Management Agency (FEMA)'s then Chief of Operational Integration, Operations Management Division Paul Schwartz, in a 2009 interview suggested that FEMA focus its preparedness efforts in the upcoming year on mass care, public health, and medical needs, among a handful of other issues (Schwartz, 2009, p. 3). The need to address medical readiness and develop a way to measure its level of preparedness is evident. EMS is an essential component of medical readiness and understanding preparedness in EMS will support the national preparedness efforts.

Lacking the ability to measure preparedness leaves local governments unaware of the EMS system's ability to respond to a disaster. Without knowledge of capabilities and capacities, the ability to respond could be left to chance and might leave residents unnecessarily vulnerable during a major event. Without measurements that identify existing capabilities against the needed capabilities to respond to and recover from a disaster effectively, it is not possible to know if the appropriate level of preparedness has been achieved. Without such measurements, local governments may continue to function under the status quo of making the best judgments possible about resource and training needs for disaster preparedness based on intuition, conjecture, and past practices. Better decisions can possibly be made using an evidenced-based disaster preparedness measurement process.

How much preparedness in EMS is enough, and what is the minimum level of preparedness needed for the system to be able to respond to all likely hazards? Will the necessary action need to gain the target level of preparedness vary by the nature of the disaster? What core common capabilities will be required to respond to the majority or probable disasters local EMS systems may face? Without clearly defining EMS system preparedness and developing a method or process to measure preparedness, these answers cannot be definitively answered.

B. RESEARCH QUESTION

Local emergency medical services agencies (LEMSA) are organizations, often at a county or regional governmental department or division level that oversee and manage EMS systems. LEMSAs typically provide medical leadership and direction for emergency service providers, as well as the authority for fire departments, ambulance companies, paramedics and others to deliver medical care to the public. LEMSAs bring the components of an EMS together into a coordinated system and prevent fragmentation, set and raise the standards for medical care, and work on solutions to system problems (Tierney, 1985, p. 78). The roles that LEMSAs are expected to play during disasters are unique and essential. As the responsibilities involve immediate and rapid care to the sick and injured, EMS plays a key part during the initial stages of disasters.

Not all U.S. states organize EMS systems according to the LEMSA model. A state agency may provide the services described above, or in some cases, a hospital or other organization may provide those services. In any regard, some organizational structure exists within each state that fulfills a LEMSA's disaster response roles. For purposes of this thesis, the organizations are termed LEMSA regardless of the actual organizational structure. This research focuses on the disaster response role played by these supporting organizations rather than the organizational structure itself.

It is important to clarify the role of a LEMSA or supporting organization from a frontline EMS system provider, such as an ambulance company or fire department. LEMSAs support the work performed by frontline EMS system providers. However, it is not necessarily the role of LEMSA staff members to be at the scene of an incident or the

command post. Sometimes this is appropriate and such activity facilitates the response. Often, a LEMSA provides its support role from an office behind the scenes, a department operations center (DOC), or an emergency operations center (EOC). This varied role of a LEMSA depends on the circumstances of the event and the disaster response plans within an individual jurisdiction. For example, a LEMSA may be responsible for treating patients. This does not necessarily mean that staff members from the LEMSA have their hands on patients at the scene and are providing frontline life-saving care. Rather, the LEMSA is responsible for working with the frontline EMS system providers to ensure the work is completed appropriately. Many LEMSA responsibilities are accomplished by delegating tasks to EMS system providers.

The *Target Capabilities List* identifies three specific response mission capabilities that clearly are the primary, and in some states, the statutory responsibility of the LEMSA. These include: 1) emergency triage and pre-hospital treatment, 2) medical surge, and 3) medical supplies management and distribution (U.S. Homeland Security Department, 2007, pp. 447–488). In the context of these three broad functional areas, the LEMSA should be prepared to accomplish the following strategic objectives.

- Meeting transport volume demand
- Distributing patients to hospitals and care facilities throughout the system and beyond to match capabilities to needs so as not to overburden one facility while another facility is working below its capacity
- Treating and releasing patients at field treatment sites or clinics, when possible
- Managing the convergence of large numbers of ambulances and personnel

According to Kathleen J. Tierney, PhD, a research associate at the Disaster Research Center, Ohio State University, in the process of accomplishing these strategic objectives, the LEMSA should be prepared to encounter the following challenges during a disaster.

- Increasing patient volumes; greater demands for care/service
- Coping with and adapting to the changed environment, whether the disaster was natural or man-caused
- Having first responders and hospitals with damaged equipment or facilities, loss of utilities, and staff shortages (Tierney, 1985, p. 80)

- Delivering care in substandard circumstances
- Increasing demand from the public, patients' families, news media, and policy makers for information; the demand for information will be exponentially greater during a disaster than on a routine daily basis (Tierney, 1985, p. 80)
- Having a means to communicate information can be diminished or insufficient; the normal communication tools and technology available on a normal day may not be fully functional (Tierney, 1985, p. 80)
- Managing and supporting large numbers of people, vehicles, and resources (mutual aid resources and volunteer good Samaritans). (Tierney, 1985, p. 81)
- Anticipating differences in types of equipment, scope of practice inconsistencies, different operational procedures, and different radio communication standards; thereby, increasing the complexity of managing the event (Tierney, 1985, p. 81)

In addition to the items identified by Tierney, it is also important to address the challenges of performing the LEMSA roles with smaller numbers of full-time employees. A difficult economic environment, a prolonged disaster response effort, or perhaps a pandemic scenario may cause this.

This thesis attempts to answer this fundamental question as it relates to a LEMSA: How confident can one be that the people put into place to respond to disastrous events possess the knowledge and resources needed to manage the situation when called upon? (Jackson, 2008, p. 11). More specifically, this research seeks to answer the following two questions.

1. What are the skills and equipment a LEMSA needs to perform its strategic duties, in light of the various types of disasters and challenges possibly faced, to fulfill its role successfully in responding to the needs of the community during a disaster?
2. What are indicators that a LEMSA's preparatory actions are sufficient to fulfill its role in responding to the needs of the community during a disaster?

II. LITERATURE REVIEW

A. INTRODUCTION

The literature review conducted for this project is fairly extensive; it contains 11 sub-sections. Each sub-section is summarized below.

Reasons for Measuring Preparedness: This sub-section contains a history of preparedness since September 11, 2001, and how preparedness efforts have evolved. A prevalent theme in the literature is that preparedness measurement is tied to funding/money. Whether the context is accountability of monies already allocated, justifying additional expenditures, or determining the cost, becoming prepared concerning funding is a significant component of preparedness.

Role of Emergency Medical Services: The Emergency Medical Services (EMS) plays a significant role during a disaster response. However, that role is significantly different from its day-to-day role. The metamorphosis in roles for disaster response requires unique actions for preparedness.

Measuring Preparedness in the Context of Emergency Management, Public Health, and Emergency Medical Services: Not much literature is available on the specific topic of measuring disaster preparedness for EMS. Consequently, it is necessary to research similar fields, such as Emergency Management and Public Health, and attempt to draw conclusions from those fields and apply the research and findings to EMS.

Measuring Preparedness is Difficult: Specific difficulties in attempting to measure preparedness are identified and discussed.

Ideas for Measuring Preparedness: Given the difficulties in measuring preparedness, a few logical approaches and methodologies for successfully conducting the measurements are presented.

Accuracy—Objective vs. Subjective Measurements: Measuring preparedness in a meaningful way cannot be performed solely with objective measurements. Rather, the use of subjective measurements is unavoidable, and subjective measurements do not invalidate the accuracy of the results.

Leadership from the Federal Level: One of the significant challenges facing disaster preparedness measurement is the lack of consistency in the measurements. Measurements vary by jurisdiction, by state, and by time. No consensus has been reached within disciplines on standardized measurements. The literature indicates that federal action to establish standard measurements is needed.

Federal Actions: Actions that have been taken by the federal government towards measuring preparedness are chronicled.

Gaps in the Literature: The lack of specific core competencies in the literature for a local EMS agency's disaster response capabilities is identified. Further, the lack of a specific definition of disaster as it pertains to EMS is not found in the literature.

Funding: Funding drives preparedness measurement efforts in many ways. Federal agencies must have a means to hold those receiving grant funds accountable for spending appropriately. Future funding opportunities can be based on the success of past funding programs; and thus, measurements become important in understanding progress. Moreover, a consistent and standardized measurement method is needed to validate if funds have been expended appropriately.

B. REASONS FOR MEASURING PREPAREDNESS

Measuring preparedness was identified as an important activity in a number of different journal articles, academic studies, Congressional reports, and other sources. A variety of reasons is given to justify measuring the extent to which the nation, states, and local jurisdictions are prepared for disasters. Measuring preparedness is somewhat of a paradox; successful preparedness results in the absence of poor outcomes during a disaster (Covington & Simpson, 2006, p. 22). In other words, a critical event that could

have otherwise been disastrous was not because of robust preparedness makes it difficult to quantify the value of preparedness. Regardless of this phenomenon, numerous research works support the concept of measuring preparedness.

With issuance of Homeland Security Presidential Directive Number 8 (The White House, 2003), former President George W. Bush ordered all federal agencies to develop metrics for preparedness. Specifically, HSPD-8 directed that measureable readiness priorities be established, and that readiness metrics and elements (including standards for preparedness assessments and strategies) be developed. The Presidential directive called for the development of a system of assessing the nation's overall prevention and response preparedness within one year from the date of issuance. Readiness assessments in rudimentary forms appear as requirements in federal homeland security grants to states and local jurisdictions.

Beyond a federal mandate, other valid reasons can measure preparedness. One such reason is to identify the strengths and weakness, or gaps, of an organization's preparedness capability and to facilitate resilience of that organization or community. According to *Homeland security: Standards for State and Local Prepardness* Congressional Research Service report, measuring preparedness facilitates improvements in response capabilities and intergovernmental coordination, and identifying gaps serves to promote long-term sustained preparedness (Canada, October 2003). It is difficult to determine the validity and weaknesses of local emergency plans unless a standardized method to measure preparedness is employed (Simpson, 2004, pp. 3–4). Moreover, measuring preparedness in a standardized manner allows one community to be compared to another. Such a comparison provides a greater understanding and context of preparedness strengths and weaknesses (Covington & Simpson, 2006, p. 6). If measuring preparedness provides knowledge and this information is used to mitigate legitimate preparedness weaknesses, then proper fact-based decisions may produce more resilient communities (Covington & Simpson, 2006, p. 6).

A premise in process improvement theory is that a baseline be established to facilitate the measurement of change. The same concept can be applied to measuring preparedness. It is difficult to determine if progress towards a goal is being made

definitively unless some method of measurement is used. Another reason for measuring performance is to understand if change has occurred from a starting point or baseline (Doherty, 2004, p. 38). Further, managers or others given the responsibility for achieving preparedness cannot provide evidence or understand the extent of progress without measurement (Falkenrath, 2000, p. 15).

The most prevalent reason uncovered in the literature for measuring preparedness relates to money. Primarily, a certain amount of accountability is needed to ensure that federal grant dollars have been and are being used wisely. Policy makers need information to make rational allocation decisions (Falkenrath, 2000, p. 15). This is evident in seeing the number of congressional bills that have been introduced to address preparedness standards; politicians want to ensure accountability for expenditure of the billions of dollars towards homeland security preparedness efforts (Canada, October 2003). By not articulating preparedness standards, endless escalation of spending may occur (Falkenrath, 2000, p. 15), especially in the heat of patriotic emotion stirred by another terrorist attack on U.S. soil. According to the Government Accounting Agency (GAO), grant programs administered by the Department of Homeland Security do not have strong accountability components (Jenkins, 2008, p. 5). This may be due to the difficulty in measuring preparedness. However, the lack of accountability for building preparedness capabilities leaves decision makers unaware if policies are effective or if policy changes should be made (Jenkins, 2008, p. 5).

Development of nationwide preparedness standards, including the development of a baseline, could lead to greater accountability. Such a tool could provide Congress and federal agencies a means of gauging effectiveness of new preparedness programs (Canada, October 2003). A considerable amount of tax dollars have been spent on disaster preparedness. Yet, it is not possible to demonstrate definitively that the investment has been worthwhile; developing accountability for expenditure of grant funds/tax money may be possible through preparedness measurements (Nelson, Lurie, & Wasserman, 2007).

Other reasons have been found that support the need to measure preparedness. Organizations using a recognized evidenced-based measurement tool may discover gaps exist in their preparedness efforts. It is plausible that such information can be leveraged in competition for grant funding (Simpson, 2004, p. 3). Towns and cities that employ an evidenced-based preparedness measurement tool and show significant progress may be used as justification to lower hazard and homeowners' insurance rates, or to allow jurisdictions to compare qualities to one another (Simpson, 2004, pp. 3–4). Further, a finding that one community is significantly behind another community in preparedness efforts can provide the political fuel to emphasize the need for increasing preparedness activity (Simpson, 2004, pp. 3–4). In any regard, measuring preparedness can be used to guide efficient allocation of resources (Covington & Simpson, 2006, p. 6), whether the resources are federal grant funds or local tax dollars.

Those opposed to measuring preparedness argue that establishing a baseline could pose a significant financial burden on states and localities and interfere with local priorities (Canada, October 2003). States and localities not meeting baselines could be pressured by constituents or through coercive federalism grant programs to shift priorities and expend resources in a direction that might be inconsistent with local needs (Clovis, 2006, p. 13). Municipalities have experienced an example of this concept recently.

Changes in federal regulations of accounting standards have required different calculations for liabilities. The new calculation promulgated by the new regulation resulted in significant unfunded liabilities being incurred with respect to future retirement costs, forcing jurisdictions to expend resources to address these new liabilities (IAFF, 2006, p. 1). Another reason for opposing establishment of federal preparedness measures is the bureaucracy associated with the measurements and accountability. Dr. Clovis found that grant accountability has become more important and requires more time and effort than achieving the actual homeland security goals (Clovis, 2006, p. 13). Although it can be argued that any federal expenditure used appropriately will probably facilitate improvement in preparedness, is there any value in taking the time to measure and quantify that change in preparedness? Given the preponderance of literature on the topic, valid reasons seem to exist to warrant further exploration of this question.

C. ROLE OF EMERGENCY MEDICAL SERVICES

Federal enabling legislation that resulted in the proliferation of civilian EMS systems in the nation occurred in 1973. According to Tierney, the law "…was based on the assumption that 'systems' of service delivery could be developed that would encompass all phases of patient care: the pre-hospital phase, which includes the immediate first response and emergency transportation; hospital emergency room care; and definitive care" (Tierney, 1985, p. 78). Thirty-one separate EMS systems exist in California, and all of them are operated on the premise described by Tierney. EMS functions on a daily basis as a system of distinct components that collaborate for the benefit of a patient or victim, as described in Table 3-1.

The role of EMS during a disaster is very different from EMS on a regular day. It can be anticipated that disasters will produce many more patients than normal. This places greater demands on the first responders, including fire departments and ambulance services, and greater patient volume impacts hospital emergency departments and the entire hospital institution. Often, events that overwhelm the normally available resources cause mutual aid to be requested from neighboring jurisdictions.

On a routine, daily basis	During a disaster
• Response time to each call	• Meeting transport volume demand
• Transport to best destination	• Distribute patients evenly through the system
• Transport to hospital	• Treat and release at field treatment site or clinics
• Normal system management	• Convergence of large numbers of ambulances and personnel

Table 3–1. Typical Goals of an EMS System—Daily vs. Disaster (From: Tierney, 1985, pp. 77–84)

It should be noted that the public might not be aware of the changing priorities of the EMS system during a disaster. The public may expect the same level of service during a disaster enjoyed on a routine, daily basis. An inability to meet the public's expectations during a disaster may be a source of criticism after the event.

During a disaster, hospitals may be faced with damage to equipment or facilities, loss of utilities, and staff shortages (Tierney, 1985, p. 80). Not only is the demand greater because of increased patient volumes, but the circumstances in which care must be delivered could be less than optimal. In addition, hospitals and EMS agencies are likely to experience a greater demand from the public, patients' families, news media, and policy makers for information. Information about the crisis, information about the status of the EMS system and hospital status, information about numbers and conditions of victims, people looking for missing loved ones, and so on. The demand for information is exponentially greater during a disaster than on a routine daily basis (Tierney, 1985, p. 80). Although demands will be greater, the means to communicate information can be diminished. Depending on the nature of the disaster, phone lines, cell phones, and Internet service may be disrupted. The normal communication tools and technology available on a normal day may not be fully functional (Tierney, 1985, p. 80).

As mutual aid resources and volunteer good Samaritans arrive, the local EMS agency will be faced with a large numbers of people, vehicles, and resources to support and manage (Tierney, 1985, p. 81). Differences in types of equipment, EMT and paramedic scope of practices, operational procedures, and radio communication standards may be experienced. These differences increase the complexity of managing the event (Tierney, 1985, p. 81).

During a disaster, the entire EMS system's concept of operation may need to endure a metamorphosis. On a daily basis, the EMS system is designed to send medical services rapidly to the scene of an emergency and rescue individual patients. In a disaster, the increased demand for service, combined with the lack of immediately available resources, forces the EMS system to centralize services. Rather than send resources to every emergency, theoretically, it may be necessary to prioritize calls. Several calls for service may go unanswered in the near term. Plans may be in place to substitute a routine response with information on locations people can go to seek emergency care on their own. The operational mode may need to transition from serving individuals to serving the masses. EMS goals during disasters are different from daily goals, as shown in the Table 3-1.

In the management of the EMS system during a disaster, the local EMS agency must strive to control patient flow (Tierney, 1985, p. 81). A large segment of the population will gravitate towards the nearest hospital following a disaster. This phenomenon, termed the *worried well*, purports that non-injured survivors of a disastrous event seek some measure of security at the nearest hospital. The large influx of people seeking medical attention, whether warranted or not, overwhelms hospital resources and diverts the few resources available away from the seriously injured victims that need immediate attention. Controlling patient flow becomes a local EMS agency's responsibility because the EMS system will fail if the hospital cannot continue to function.

Techniques used to control patient flow vary, but the first step typically involves closing off access to hospitals. All doorways are locked and guarded, and no one is allowed entrance to the main facility. The lockdown occurs simultaneously with the establishment of external triage capabilities. Performing a quick assessment of each patient's condition provides the opportunity to filter the *worried well* out and identify patients that need immediate medical intervention. The *worried well* and lower acuity patients are placed in a queue for treatment, which may be several hours to several days depending upon the event. Federal law, the Emergency Medical Treatment and Labor Act (EMTALA), prohibits hospitals from turning patients away and refusing treatment (U.S. Department of Health and Human Services, 2010). However, patients may be informed of alternative treatment sites for more rapid service, such as a clinic or temporary first aid station, where some level of care can be provided in a timelier manner. Higher acuity patients are typically admitted to the hospital before lower acuity patients or transferred to another facility that can provide appropriate care.

The role that local EMS agencies are expected to play during disasters is unique and essential. As the responsibilities involve immediate and rapid care to the sick and injured, EMS plays a key part during the initial stages of disasters. The *Target Capabilities List* (U.S. Homeland Security Department, 2007, pp. 447–488) identifies 21 specific mission types that fall into the Response Mission Capabilities arena. Of these 21,

three clearly are the primary responsibility of the LEMSA, which include: 1) emergency triage and pre-hospital treatment, 2) medical surge, and 3) medical supplies management and distribution.

1. Measuring Preparedness in the Context of Emergency Management, Public Health, and Emergency Medical Services

Much of the literature found regarding disaster preparedness is in the context of emergency management, which is a distinct and different professional discipline from public health and from emergency medical services. Persons employed by an emergency management agency or department are not typically affiliated or organizationally aligned with public health or EMS functions. Yet, many of the concepts of disaster preparedness relative to emergency management can also be applied to public health and EMS, or any government agency that has a role in disaster response. Inasmuch as EMS and emergency management have prominent roles in the operations divisions of an incident response (U.S. Homeland Security Department, 2004, pp. ESF#8–1), EMS and emergency management functions are similar in this regard. Further, the similarities in disaster response roles between EMS and public health are even stronger (U.S. Homeland Security Department, 2007, pp. 447–488). Many of the concepts found in the emergency management and public health literature apply to EMS.

Although a great deal of information on measuring preparedness for the emergency management discipline and the public health discipline were found, few resources and literature were written about measuring preparedness in EMS. In the absence of many EMS-specific documents relative to measuring preparedness, it was necessary in the course of this research to rely upon research conducted for emergency management and public health, and attempt to draw conclusion based on the parts of those disciplines. Given similarities and common roles, lessons from these other disciplines might be applicable to and valid for EMS.

2. Measuring Preparedness Is Difficult

One of the key challenges in measuring preparedness appears to be the lack of consistency or consensus in: 1) defining an emergency or disaster, 2) identifying competencies to measure, 3) determining data to be collected for measurements, and 4) selecting performance indicators. The inconsistencies are not solely within specific disciplines but are found across several disciplines. Problems in measuring preparedness are not based on the lack of creative measurements. Rather, in the case of public health, myriad measurement indicators exist; thereby, making it difficult for professionals within the discipline to reach consensus on a common set of appropriate measurements.

An analysis performed by the RAND Corporation at the request of the National Defense Research Institute, concluded that disaster preparedness could not be measured without first standardizing measurements of organizations and communities (Davis, Mariano, Pace, Cotton, & Steinberg, 2006, p. 68). Accurate comparisons are not possible without standardized measurements, and comparisons are necessary to provide context to the measurement results. A separate RAND study found that policy makers and public health officials could not reach agreement as to how to measure public health emergency preparedness (Nelson, Lurie, Wasserman, Zakowski, & Leuschner, 2008, p. 1); nationwide consensus could not be reached. The lack of consensus on standardized measurements is a barrier to measuring disaster preparedness in public health, and this barrier will prevail until consensus on measurements can be reached (Nelson, Lurie, & Wasserman, 2007, p. 13). The lack of consensus does not seem to be limited to public health. Another RAND study ties the problem with lack of clear metrics to the fact that no clear performance standards exist by which to evaluate preparedness (Nelson, Lurie, & Wasserman, 2007, p. 10). A study from the University of Louisville determined that no single theory or set of theories existed for core concepts in disaster preparedness planning or practice; without a solid theoretical foundation in disaster preparedness planning, reaching consensus on measurements is problematic (Covington & Simpson, 2006, p. 3). In a study conducted by UCLA and RAND, researchers found that, "…although there are a multitude of instruments for measuring preparedness with a great deal of overlap in domains, there is little agreement about what actually constitutes preparedness or how it

should be measured." (Asch, et al., 2005, p. 539) Struggles among professionals to define preparedness make an effort to measure it a moving target. A Congressional report also recognizes the difficulties in measuring preparedness. The report suggests the lack of consensus and definition may be solved with federal leadership in establishing definitions and measurements. However, even this report concludes that defining a baseline of preparedness for measurement purposes to be a "daunting challenge" (Canada, October 2003).

3. Ideas for Measuring Preparedness

Although it has been established that measuring preparedness is difficult, it has also been established that measuring preparedness is necessary. The literature contains concepts and ideas for overcoming some of the problems identified above and for moving forward.

One consistently repeated premise is that preparedness efforts cannot be successful unless consensus exists within the professional discipline being measured. Covington and Simpson offer the idea that key individuals in the disaster preparedness community need to come together and develop adequate measurements (Covington & Simpson, 2006, p. 23). Once consensus is reached among some key stakeholders within the discipline, the product can be introduced to policy makers for inclusion in legislation or grant guidance instructions.

The concept was taken a step further. A report from 2008 described a project where public health experts were convened as a panel to: 1) define public health emergency preparedness, and 2) reach consensus on the broad elements that should be part of a preparedness plan (Nelson, Lurie, Wasserman, Zakowski, & Leuschner, 2008, p. 11). Consensus was reached among the panelists on a definition of public health emergency preparedness, and the participants were hopeful that the definition could be used as a foundation for building standards and metrics in public health preparedness. Other literature citied previously also mentions the benefits and necessity of reaching consensus within disciplines on a basic set of goals and metrics.

Covington and Simpson also provide guidance for creating successful measurements. Data used to draw conclusions must be accurate and consistent; the data must be used to produce valid and reliable results; and stakeholders within the discipline must agree upon the data to be used (Covington & Simpson, 2006, p. 24).

For most people and jurisdictions, disasters are rare occurrences. Building competency in responding to disasters can therefore be difficult because of the infrequent nature of performing disaster-related tasks. Low frequency, high consequence events require individuals to act regularly to avoid losing skills (Graham, 2002, p. 2). Several references in the literature suggest that disaster-related activities and skills somehow need to be incorporated into everyday tasks. Falkenrath refers to the concept as *dual-use* activities. His comments are in the context that federal grants attempting to achieve protection against weapons of mass destruction (WMD); actions by local governments to mitigate WMD must be the same actions required during daily routines so as not to lose the skills over time (Falkenrath, 2000, p. 25). In 2007, Nelson et al. terms the concept *crosscutting capabilities*, "those that are required to execute a broad spectrum of functions…efforts should be undertaken to identify routine proxies for key emergency response functions, perhaps resulting in some sort of national clearinghouse of embedded assessment templates and metrics" (Nelson, Lurie, & Wasserman, 2007, p. 13). The panel of public health experts studied by Nelson et al. in 2008 indicates that continuous changes in staffing through turnover and attrition require a continuous effort at preparedness. They conclude that the only practical method of remaining prepared for disasters is to integrate disaster functions into daily duties (Nelson, Lurie, Wasserman, Zakowski, & Leuschner, 2008, p. 9). The expert panel continues to indicate that creating special disaster-related duties works against achieving preparedness. New procedures for emergency situations should not be developed because they cannot possibly be effectively implemented during a crisis.

One method used to build disaster preparedness competency in a public health setting was the development of a board game. Employees were rewarded for advancing down the path of preparedness, as depicted in the game (Parker, Barnett, Fews, Blodgett,

& Links, 2005, p. 505). The board game concept may build competency and awareness, but this approach does not incorporate activities into daily routines. Gained skills might diminish over time without repetition.

As mentioned previously, the lack of consensus on what and how to measure preparedness is a pervasive problem in the emergency management and public health disciplines. One study suggests that perhaps each discipline develop a set of metrics unique to that discipline's needs (Covington & Simpson, 2006, p. 11). Unique and specific measurements may provide a better opportunity towards achieving consensus while building a measurement framework relevant to the discipline. The *Target Capability List* is a comprehensive first attempt to define tasks for all phases of disaster preparedness for multiple disciplines (U.S. Homeland Security Department, 2007).

4. Accuracy—Objective vs. Subjective Measurements

Some of the difficulties in measuring preparedness have been identified, such as lack of consensus on data or measurement, lack of definitions, disagreements within disciplines on core principals and competencies, and so on. Further, the need for accurate data has been identified as being important for successfully measuring preparedness. Yet, the literature seems to indicate that purely objective measurements are elusive. Some suggest that subjective measurements will always be part of disaster preparedness.

Covington and Simpson state, "all indicators, no matter how scientific, contain a degree of subjectivity and values." In fact, the authors place a great deal of significance in the opinion of experts, stating that practitioner experience and expertise will be valuable in building disaster preparedness metrics (Covington & Simpson, 2006, p. 26).

As the development of measuring preparedness is fairly new, sources of data are not readily available to rely upon for research. When data is not obtainable, researchers must gather expert judgments and opinions. Often, data is self-reported (Jackson, 2008, p. 22). Consequently, it is sometimes necessary to rely not only upon the opinions of experts, but those same experts may be offering opinions as to their own level of preparedness. It may be necessary to accept a certain amount of bias in the study of

preparedness. Asch et a.l offer a similar opinion when suggesting that the lack of evidence forces reliance on expert opinion. They further propose an expert opinion may be better than nothing, but a truly objective measure is best (Asch et al., 2005, p. 539).

The literature indicates that it is impossible to have 100 percent accuracy with a disaster preparedness measurement model. However, the lack of pure accuracy is not the biggest problem. Rather, the greatest problem is the failure to reach consensus on which metrics to use (Covington & Simpson, 2006, p. 27).

5. Leadership from the Federal Level

Given the seeming lack of progress towards consensus on definitions, goals, and measures of preparedness, many references in the literature suggest the federal government lead the effort to establish consistent standards and definitions. Establishment of standards by local and state governments would be too fragmented, and achieving consistency would remain a daunting task. As the federal government is the common denominator to all jurisdictions in the nation, many of the resources conclude the federal government is the logical entity for addressing the problem of measuring preparedness.

In 2000, Falkenrath described the nation's preparedness efforts as a bottom-up rather than top-down approach; meaning the federal government did not have a guiding strategy for preparedness (Falkenrath, 2000, p. 4). While some looked to FEMA as the agency most likely to lead efforts in preparedness, budgetary decisions and dynamics associated with perceived competition against the Department of Defense prevented FEMA from taking this role. Prior to 9/11, Simpson states, "…the U.S. domestic preparedness program was composed of multiple loosely coupled component programs"; the programs were highly fragmented (Simpson, 2004, p. 10).

Asch et al. attempted to define the federal government's role in establishing accountability standards for using preparedness grant monies appropriately. They purport that it is difficult to hold a local government accountable for meeting specific preparedness standards when grant monies are distributed based on politics rather than demonstrated need. Moreover, the federal and state governments' inability to articulate

their own accountability standards make it impossible for local governments to establish such standards (Asch et al., 2005, p. 540). The federal government must take the lead in setting such standards for all other levels of government to follow.

In 2007, Nelson et al. stressed the need for metrics based on exercises and drills. Standards developed at the national level avoid the fragmentation of states attempting to establish exercise metrics. However, the clear standards expected by Nelson et al. would be that the federal government establish desired outcomes, yet leave the flexibility to states and locals to determine how to achieve the outcomes creatively (Nelson, Lurie, & Wasserman, 2007, p. 12). Moreover, federal funding should be contingent upon evidence of a relationship between desired outcomes and the structure of public health preparedness (Nelson, Lurie, & Wasserman, 2007, p. 7). By 2008, one group was urging the federal government to, "make national preparedness an urgent priority, particularly public health and medical readiness" (Center for American Progress, 2008, p. 1).

Testimony before the House of Representative Subcommittee on Homeland Security, Committee on Appropriations, by William O. Jenkins, director Homeland Security and Justice Issues, General Accountability Office given in 2008, was critical of Department of Homeland Security's ability to measure the nation's preparedness. It was noted that DHS' grant programs did not have strong accountability components; the federal government could not determine if states and local governments were building preparedness capabilities, or to what extent capabilities had been affected or improved (Jenkins, 2008, p. 5). Further, the GAO criticized DHS for not having the means to measure program outcomes (Jenkins, 2008, p. 18). The criticism may be too harsh; the literature seems to suggest that no one has yet to develop a means of measuring preparedness acceptable to all stakeholders; consensus remains difficult to achieve.

6. Federal Actions

Action taken by President Bush in 2003 with issuance of HSPD-8 was a substantial commitment by the federal government to assume a leadership role in disaster preparedness (The White House, 2003). The *National Preparedness Guidelines* (NPG), developed as a direct result of HSPD-8, are intended to organize and synchronize all

levels of government in preparedness efforts and guide investments in national preparedness. Further, the NPG is intended to establish readiness metrics to measure progress and a system for assessing the nation's overall preparedness (U.S. Homeland Security Department, 2007).

Within the umbrella of the *National Preparedness Guidelines*, two key components have been developed, the *Universal Task List* (U.S. Homeland Security Department, 2004) and *Target Capabilities List* (U.S. Homeland Security Department, 2007). Both attempt to provide standards and metrics for multiple aspects and disciplines of disaster preparedness. Some have identified weaknesses in these measurements. Jackson indicates that many of the items on the *Target Capability List* are simply checklists. Further, Jackson argues that checklists are not adequate because they mainly assess quantity but do not measure the nuances of quality (Jackson, 2008, p. 7).

The elements of the *Target Capabilities List* most applicable to EMS are: 1) emergency triage and pre-hospital treatment, 2) medical surge, and 3) medical supplies management and distribution. Each element contains a list of preparedness measures. The measures are in a format similar to a checklist, and the measures range from very specific to very broad. For example, a performance measure in the Emergency Triage and Pre-hospital Treatment element specified, "recall procedures to summon off-duty EMS personnel when needed are in place" (U.S. Homeland Security Department, 2007, p. 438). This is a vague measurement, but it can be answered as yes or no. A more specific example is, "all cities have a minimum of one spare ALS [advanced life support] vehicle available" (U.S. Homeland Security Department, 2007, p. 438). This preparedness measurement is much more narrowly defined, but one must question the validity of the measurement. The availability of one additional ambulance for Los Angeles, New York, Chicago, or even Bakersfield, seems to be an insignificant contribution to a disastrous event. The concept of the preparedness measures in the *Target Capabilities List* by function is a beneficial first step, but each measurement will likely need refinement. Before the list can be deemed a valid indicator of achieving the outcomes communities expect of disaster preparedness efforts, more study is necessary.

7. Gaps in the Literature

No definitive listing of preparedness measurements have been encountered in the literature representing competencies in EMS, that when implemented, will result in specific expected outcomes from a LEMSA's response to a disaster. Most of the literature on measuring medical preparedness is in the context of emergency management or public health. Very little EMS-specific information is available. Of the small amount of EMS information found, most pertained to field operations; even less was available on the administration of the EMS system or LEMSA. As a LEMSA plays a key role in the support of the EMS system and support of emergency medical operations, a gap exists in the literature for this niche sub-discipline.

Specific core competencies for LEMSAs must be developed. Ideally, upon mastering the core competencies, the LEMSAs will be able to provide the support to the EMS system needed to address the most probable disaster situations. Much of the problem experienced by the public health discipline in measuring preparedness is based on the inability to reach consensus on: 1) defining an emergency or disaster, 2) identifying competencies to measure, 3) determining data to be collected for measurements, and 4) selecting performance indicators. Using this knowledge to avoid repeating past failure, the development of these four elements and attempting to achieve consensus among the LEMSA administrator discipline may be worthy of further study.

Simpson argues that defining a disaster is an essential component to understanding how to measure preparedness (Simpson, 2004, p. 2). The argument has merit inasmuch as solving a problem is likely going to be easier with an understanding of the root causes of the problem. Jackson offers that three pieces of information are needed to define emergency preparedness: 1) identify the type of damage; 2) identify actions needed in response to damage; and 3) identify the capabilities and resources needed to conduct the response (Jackson, 2008, p. 3). Simpson and Jackson seem to be after the same concept, which is to break the problem into smaller parts to facilitate an understanding of the problem, which in turn, leads to possible solutions.

One of the fundamental questions asked by Jackson is, “how confident should we be that the systems we have put into place to respond to damaging events will be able to deliver when we call upon them?” (Jackson, 2008, p. 11). With respect to LEMSAs, the answer to this question today is that confidence is low. The absence of basic definitions and the absence of preparedness measurements coupled with little effort to achieve consensus on these matters indicates that research is needed in this field.

8. Funding

A recent Naval Postgraduate School thesis (Donnelly, 2007) suggests that capabilities-based assessments are the foundation of planning, yet no national standards in various homeland security programs for performing such assessments exist. Of the capability-based assessments created, there is no nexus to funding. Without the correlation, it is difficult to understand the extent to which the investment in homeland security is moving the nation towards meeting preparedness goals (Donnelly Sr., 2007).

Issues related to funding and measuring preparedness are relevant in three important ways. First, government leaders and the public want bureaucracies at all levels of government to be held accountable for using appropriations as intended (Woodbury, 2005, p. 1). According to the GAO, grant programs administered by the Department of Homeland Security do not have strong accountability components (Jenkins, 2008, p. 5). This may be due to the difficulty in measuring preparedness. However, the lack of accountability for building preparedness capabilities leaves decision makers not knowing if policies are effective or if policies should be changed (Jenkins, 2008, p. 5). Development of nationwide preparedness standards including development of a baseline could lead to greater accountability.

Second, future investments in preparedness and homeland security can be guided using the results of performance measurements and capability assessments (Woodbury, 2005, p. 1). Having a set of performance measures could provide Congress and federal agencies a means of gauging effectiveness of new preparedness programs (Canada, October 2003). A considerable amount of tax dollars have been spent on disaster preparedness. Yet, it is not possible to demonstrate definitively that the investment has

been worthwhile; developing accountability for expenditure of grant funds/tax money may be possible through preparedness measurements (Nelson, Lurie, & Wasserman, 2007, p. 2).

Third, it is difficult to demonstrate effectiveness at protecting the nation and for accomplishing the goals intended to be achieved without some accepted and recognized method of measuring results (Woodbury, 2005, p. 1). Organizations using a recognized evidenced-based measurement tool may discover gaps exist in their preparedness efforts. Identifying the strengths and weakness, or gaps, of an organization's preparedness capability may facilitate resilience of that organization or community. According to a congressional report, measuring preparedness facilitates improvements in response capabilities and intergovernmental coordination, and identifying gaps serves to promote long-term sustained preparedness (Canada, October 2003). It is difficult to determine the validity and weaknesses of local emergency plans unless a standardized method to measure preparedness is employed (Simpson, 2004, pp. 3–4). Moreover, measuring preparedness in a standardized manner allows one community to be compared to another. Such a comparison provides a greater understanding and context of preparedness strengths and weaknesses (Covington & Simpson, 2006, p. 6). If measuring preparedness provides knowledge and this information is used to mitigate legitimate preparedness weaknesses, then proper fact-based decisions may produce more resilient communities (Covington & Simpson, 2006, p. 6).

Ultimately, the level of preparedness and the amount of funding devoted to preparedness is a local decision. Local jurisdictions decide how much of the local funding resources will be used for preparedness, and local jurisdictions will decide if participation in a federal grant program is worth the responsibility of meeting the federal mandates associated with the funding.

Not all states, counties, cities, and tribal entities may want to achieve the level of preparedness that a neighboring jurisdiction has achieved. More important issues other than disaster preparedness may first need to be addressed to meet local needs. It is incumbent upon local policy makers to establish priorities for use of resources (Errea,

2008, p. 14). Measuring preparedness may allow more informed decisions to be made. By understanding the extent to which a jurisdiction is prepared compared to others provides a context for making wise resource allocation choices.

Funding is an important aspect to successful preparedness; resources must be devoted to preparedness efforts to maintain readiness and skills. Similarly, appropriate and sustained funding is a key component to providing an EMS system possessing the capability to respond to a community's disasters. Competing for scarce local resources or federal grant funding will perhaps have greater credibility and stronger justification if results can be demonstrated to policy makers and the public. In the absence of actual performance during a disaster, which is a rare event, development of a method for measuring preparedness can be an appropriate substitute to demonstrate strengths, weaknesses, and capabilities of a system. Yet, a review of the literature indicates that no widely accepted or highly refined measures of preparedness for EMS exists. Consequently, EMS administrators do not have accepted or recognized tools available for identifying the appropriate level of EMS system disaster preparedness for the communities and jurisdiction being served. In the absence of such tools or methods, it is difficult to prove that existing systems' capabilities are adequate or inadequate. EMS plays a crucial role in saving lives and reducing suffering, including during disasters. Building a methodology or tool to measure preparedness may be beneficial, if system weaknesses can be identified and mitigated before a disaster occurs.

III. HYPOTHESIS

Defining and measuring preparedness can seem difficult and complex, and measuring a LEMSA's level of preparedness is likely to be challenging. Yet, it is important and necessary to measure a LEMSA's level of preparedness. It is possible and practical to define the skills and equipment[1] that a LEMSA will need to perform strategic disaster response duties common to most if not all types of disasters. Once the common duties are defined and understood, it is possible to define performance indicators that can confirm that a LEMSA's preparatory actions are sufficient to fulfill its disaster response role.

The literature indicates no nationally recognized or generally accepted measurements exist for assessing a LEMSA's level of preparedness for disasters. The public health and emergency management disciplines have been plagued by a lack of consensus defining a disaster and defining preparedness, which has led to the absence of accepted or recognized measurements. Consensus has not been reached on selecting performance indicators and the data to be collected for measuring preparedness. Similarly, identifying the common capabilities that a LEMSA must possess to appropriately function during a disaster remains undefined.

Reasons for measuring preparedness levels are numerous, as identified in the literature. Measurements provide the opportunity to identify strengths and weaknesses of a jurisdiction's readiness. Once gaps in preparedness are known, actions can be taken to mitigate the problem areas. Additionally, if gaps are found in a jurisdiction's preparedness efforts, such a finding from a recognized and uniform measurement process might be used as evidence to request the reallocation of funding to resolve the issue.

[1] Consensus has not been reached on defining a disaster and defining preparedness in the EMS discipline. Further, identifying the common capabilities that a local EMS agency must possess to appropriately function during a disaster remains undefined. Consensus has not been reached on selecting performance indicators and the data to be collected for measuring preparedness. To narrow the scope of this thesis and make it possible to complete this thesis within the allotted time, the research was narrowed to skills and equipment. Processes to use the equipment were not included in the study.

Measuring preparedness provides a means to hold jurisdictions accountable for the use of federal preparedness grant funds. Policy makers and the public want assurance that taxpayer money is being used wisely and efficiently. According to the GAO's testimony before a Congressional subcommittee, approximately $20 billion in grant funds were awarded to states and local governments for emergency preparedness between 2002 and 2007; about one-third of these funds were unspent as of January 2008 (Jenkins, 2008). Accountability is important for continued support for similar grant programs. Measuring change in preparedness and having the ability to demonstrate that progress is being made provides accountability.

Further, by measuring preparedness, the policy doctrine that serves as the basis for preparedness grant funding can be tested for validity. The value and success of a policy initiative can be determined, and measurements can provide evidence to continue or discontinue a program. For example, if federal grant funding is used by local jurisdictions for disaster preparedness, it should be possible through standardized measurements to demonstrate that certain preparedness benchmarks have been achieved. If a majority of those jurisdictions is unable to meet the preparedness benchmarks, it may be an indicator that the policy is flawed or unrealistic.

Measuring jurisdictions with the same preparedness standards provides the opportunity for comparisons; a context is provided in which to determine if one town is more prepared or less prepared than another. Comparisons of preparedness levels can be important in assessing risk and threats. Those jurisdictions that choose to make heavy investments and commitments to disaster preparedness may be more resilient. The consequences of a disastrous event may be lower than a community that has not made the same investments and commitments. Further, distribution of grant funds or use of local tax dollars might be affected in regards to risk and quantifying preparedness.

Evidence that underscores the importance of measuring preparedness includes Homeland Security Presidential Directive No. 8 (The White House, 2003), which emanated from weaknesses apparent in the 9/11 terrorist attacks. HSPD-8 ordered that a system for measuring preparedness be developed. Beyond terrorist attacks, natural disasters also pose threats to this nation. The failed preparedness components to

Hurricane Katrina at all levels of government and the resulting devastation to New Orleans and other gulf areas establish a need to measure preparedness. Had policy makers at the federal, state, and local level known the real state of preparedness in New Orleans, perhaps actions and interventions could have taken place sooner to mitigate or prevent many of the problems that did occur.

Further, evidence that measuring a LEMSA's level of preparedness is a practical endeavor appears in a report from a summit held in June 2007 to discuss lessons learned from Hurricanes Katrina and Rita. State EMS officials from throughout the nation developed a consensus report on conceptually defining the EMS discipline's response capabilities at a national level (National Association of State Emergency Medical Services Officials, 2008). Although the context of the report is for a national response, many of the concepts can be applied to a LEMSA. The inability of the public health and emergency management disciplines to achieve national consensus on defining preparedness has been a major obstacle in measuring preparedness; NASEMSO's *Consensus Report* may be the tool to remove the obstacle in the EMS discipline.

It is appropriate to note that although National Association of State EMS Officials (NASEMSO) did reach consensus at the national level on six common disaster preparedness themes (National Association of State Emergency Medical Services Officials, 2008), these may or may not represent consensus among LEMSAs. People working in EMS administration at the state level have a different perspective, different demands, and different goals than LEMSAs. The local level is often at the front line of a disaster, whereas state officials must not always be forced to deal with the consequences of a disaster on a local community. The variance in roles between state and local jurisdictions cause the needs and realities to be different. Consequently, one can argue that consensus among all 50 state-level EMS leaders does not necessarily represent consensus on the same issues at the local level. In this author's experience and observations, rarely does 100 percent support exist among LEMSAs in California for every action taken by the state EMS agency. However, for purposes of this thesis, it will be assumed that the consensus reached by NASEMSO is applicable to the local level and does represent general support among LEMSAs for the disaster preparedness concepts.

Woodbury presents additional evidence that measuring preparedness is possible and practical. He demonstrates through examples the ability to measure preparedness through modeling, breaking complex parts into components, and he shows examples of using outputs to measure outcomes (Woodbury, 2005).

Evidence does exist to support the premise that disaster preparedness can and should be measured, as presented above. Yet, opposing opinions regarding measuring preparedness have surfaced in the literature. One argument against measuring preparedness is that establishing a baseline could pose a significant financial burden on states and localities and interfere with local priorities (Canada, October 2003). By using a disaster preparedness measurement as a national yardstick in making value judgments of the preparedness of a community, pressure may be brought to bear on local leaders to shift priorities and resources to meet some kind of national standard. It is plausible that high priority local needs, such as repairing a leaky roof at a senior center, can be overridden to achieve preparedness standards. Measuring disaster preparedness may place local policy makers in the position of weighing local priorities against national priorities, and in doing so, reallocate resources that might otherwise have been used to improve the quality of life. For purposes of this thesis, it is assumed that the advantages of measuring disaster preparedness outweigh the disadvantages. Although additional information may complicate local policy decisions, the consequences of not having enough information can be even more detrimental.

Clovis found that federal homeland security grant accountability had become more important and required more time and effort than achieving the actual homeland security goals (Clovis, 2006, p. 13). If measuring disaster preparedness for purposes of grant accountability becomes so burdensome that it hampers the purpose of the program, then obviously change is needed. It is important to develop meaningful yet not overly burdensome measurements.

IV. METHODOLOGY

A. INTRODUCTION

As found through the literature review, academic resources about disaster preparedness for the emergency medical services discipline are not widely available. Even fewer references and published reports exist for the secondary support role that local emergency medical services agencies or like-organizations play in response to disasters. Consequently, the method used to examine the topic in more detail necessitates gathering information from people through surveys and conversations.

Research conducted for this thesis can be classified as qualitative. Although a normative survey was conducted for part of this research and those results can be quantified, the most meaningful information was gathered through person-to-person interviews and conversations. A phenomenological study was used to understand the perceptions and perspectives of people performing EMS support duties during disasters or mass-casualty events (Leedy & Ormrod, 2005, p. 139). Lengthy interviews using open-ended questions were conducted with 10 people from across the nation possessing experience responding to at least one type of disaster. The type and magnitudes of disasters varied significantly.

The phenomenological study was used because this research method focused on studying human events, interpersonal relationships, and creative problem solving (Leedy & Ormrod, 2005, p. 133). It is appropriate in this type of study for the researcher to interpret responses from the interviews and attempt to understand any social phenomenon (Leedy & Ormrod, 2005, p. 133). Through analysis of the data collected through this method, the researcher was searching for any commonalities and stark differences in regards to skills and equipment used in the disaster response between the interviewees. It was anticipated that such a study might "…reveal the nature of these multiple perspectives" (Leedy & Ormrod, 2005, p. 133).

B. RESEARCH PARTICIPANTS AND EVENTS

Many disasters have occurred throughout the nation. Core LEMSA disaster response functions were performed for many if not all of these disasters. If past success is a reliable predictor for performing the same functions in the future successfully, it is relevant to discover the aspects of the past actions that contributed toward success. This research attempted to solicit information from people possessing such first-hand experience.

People targeted for interviews, the research participants, were screened to ensure they had first-hand experience in responding to a disaster or other non-routine multi-casualty event. The people interviewed for this research project were directly involved in performing or supporting the following broad EMS activities (California Emergency Medical Services Authority, 2003).

- Assessment of Immediate Medical and Health Needs
- Coordination of Patient Distribution and Medical Evacuation
- Coordination of Disaster Medical and Health Resources

After the invitations to participate in the research were distributed, and the respondents were screened to ensure the inclusion parameters were met, a final list of disasters and participants was developed. EMS people involved in the events shown in Table 4-1 were included in the study and interviewed.

Type of Event	Event Name	Location	Date of Event	Title of Study Participant
bridge collapse	Hyatt-Regency sky bridge	Kansas City, Missouri	July 17, 1981	EMS Director
airplane accident	Alaska Air 261 crash	Ventura, CA	January 31, 2000	EMS Coordinator
terrorism	9/11 Pentagon attack	Arlington, Virginia	September 11, 2001	Asst. Fire Chief, EMS Division
earthquake	San Simeon	San Luis Obispo, CA	December 22, 2003	EMS Agency Director
landslide	La Conchita	La Conchita, CA	January 10, 2005	EMS Administrator
hospital evacuation	Beverly Healthcare Center	Stockton, CA	July 23, 2006	EMS Administrator
active shooter	Virginia Tech shootings	Blacksburg, Virginia	April 16, 2007	Emergency Services Coordinator
wildfire	San Diego firestorms	San Diego, CA	October 2007	Chief of EMS
train accident	Chatsworth Train Collision	Chatsworth, CA	September 12, 2008	EMS Agency Director
vehicle accident	Hwy 101/Soledad Bus Crash	Soledad, CA	April 28, 2009	EMS Agency Director
wildfire	Jesusita Fire	Santa Barbara, CA	May 2009	EMS Agency Director

Table 4–1. List of Disasters and Participants Included in the Study

The eleven disasters included in the study offer a wide range of event types. Four events are natural disasters (two wildfires, earthquake, landslide); three events involve various commercial vehicle accidents (train, bus, airplane); two events were intentional, man-made crimes (terrorism, active shooter); and the remaining two events were accidental engineering failures (bridge collapse and air conditioning failure). Most of the events occurred within the past 10 years, but one event occurred 29 years ago, in 1981. Geographically, eight of the 11 events included in the study occurred in California. Only three events included in this study occurred in states other than California, two in Virginia, and one in Missouri. There was not as great of diversity in national geography as originally envisioned in the study design, and this might be considered a weakness in the data when trying to develop findings that could be applied throughout the nation. Clearly, the data is heavily drawn from California. This is partly because the researcher is an EMS official in California. Gaining access to colleagues and counterparts in other areas of California was not as difficult as seeking cooperation from strangers in other

states. Nonetheless, it can be argued that the method of EMS response to disasters in California is not radically different than it is throughout the rest of the nation. If true, then the conclusions of this study may be applicable to most if not all other states.

Additionally, each person needed to have performed at least one of 27 different core EMS disaster response roles to be included in the study (California Emergency Medical Services Authority, 2003). Table 4-2 shows the 27 core EMS disaster response roles.[2]

Obtaining information from people with first-hand relevant experience is presumed to provide unique and informed perspectives of the skills and equipment most useful in disaster response. As Leedy and Ormrod state, "by looking at multiple perspectives of the same situation, the researcher can then make some generalizations of 'what something is like' from an insider's perspective" (p. 139). The researcher invited LEMSA administrators, LEMSA medical directors, LEMSA staff members, state EMS representatives, and field responders engaged with a LEMSA's response activity from organizations that have mounted actual disaster responses to participate in the study.

[2] Not all 27 roles will be performed directly by the LEMSA. Rather, the LEMSA is responsible for coordinating with other entities to ensure the roles are performed. Many of the responsibilities of a LEMSA are accomplished by delegating tasks to EMS system providers. For example, Function No. 1 in part states, "initiate recall to staff spare ambulances." In practice, a LEMSA would likely delegate this task to an ambulance company. The LEMSA's task would be to ensure that it was done.

Assessment of Immediate Medical and Health Needs

1. Activation of the Disaster Medical and Health System and notification of key positions; initiate recall to staff spare ambulances and provide immediate surge capability
2. Transformation of pre-hospital system to disaster status
3. Activate medical surge plans, procedures, and protocols
4. Establish effective, reliable interoperable communications between EMS, incident command, public health, and healthcare facilities
5. Develop situation status information and report status to appropriate channels/levels

Coordination of Patient Distribution and Medical Evacuation

6. Coordinate triage and pre-hospital treatment operations with on-site Incident Command
7. Manage pre-hospital patient distribution and patient tracking
8. Coordinate the establishment of temporary Field Treatment Sites (FTS); designate, manage and support FTS
9. Manage facility-to-facility transfers (interfacility transfers)
10. Coordinate the evacuation from damaged or overwhelmed medical facilities
11. Activate alternative care sites and overflow emergency medical care facilities to manage hospital surge capacity
12. Coordinate evacuation of casualties to outside the area if the local capacity were exceeded
13. Coordinate receiving of casualties from other jurisdictions (providing mutual aid)

Coordination of Disaster Medical and Health Resources

14. Maintain an EMS resource inventory for the system
15. Track use and assignments of personnel, equipment, and other non-disposable medical resources
16. Provide medical support, safety considerations, and PPE for EMS responders and hospitals
17. Assess need for additional medical resources (mutual aid)
18. Ability to acquire, allocate, mobilize, and support additional resources (mutual aid)
19. Activate healthcare workers' and volunteers' call systems
20. Manage support to hospitals; ensure adequacy of medical equipment and supplies in support of immediate medical response operations and for restocking supplies/equipment requested
21. Coordinate acquisition of private source medical supplies
22. Manage support to other health facilities; coordinate with alternative emergency medical providers (clinics, skilled nursing facilities)
23. Monitor supply usage and stockpile levels of health facilities, mass prophylaxis sites, and other critical care venues; process and manage requests for additional medical supply personnel or equipment
24. Request Strategic National Stockpile assets from Centers for Disease Control
25. Ensure the timely provision of medical supplies to shelters and mass care and medical facilities
26. Provide personnel for shelters and mass care and medical facilities
27. Implement austere medical care standards, as appropriate, to manage mass casualty events

Table 4–2. List of Core EMS Disaster Response Functions (From: California Emergency Medical Services Authority, 2003)

Ten interviews were conducted for the 11 events shown in Table 4-1. The respondent for the San Simeon earthquake and the Highway 101/Soledad Bus Crash is the same person. Tom Lynch was employed in the counties where these two events occurred about six years apart. Each of these 11 disasters or non-routine multi-casualty events involved an EMS response and required the performance of many of the common and core EMS disaster response functions. Table 4-2 lists the core EMS disaster response

functions. Given the wide range of event types, finding commonalities in the types of skills and equipment used to mount a successful response may be a significant finding. The information obtained through the stories told by these people with first-hand experience is compelling, important, and useful.

C. DATA COLLECTION—SURVEY AND INTERVIEW

The survey used in this study contained two distinct parts. The first part consisted of 27 statements representing the core EMS disaster response functions (California Emergency Medical Services Authority, 2003). See Table 4-2. Participants were instructed to select all items from the list they performed during their event. These series of closed-ended questions served two purposes, to validate that EMS functions actually performed, and to determine if some of the core functions were common among the various types of events.

The second part of the survey consisted of nine open-ended essay questions, which formed the basis for interviews. Verbal interviews were conducted over the telephone with eight of the 10 participants. The conservations were recorded and later transcribed into text. Two of the participants opted to provide written responses to the essay questions in lieu of an interview. Appendix A contains a list of all of the survey questions.

Questions were developed to ignite a conversation about the event and each agency's role and successes. An *appreciative inquiry* (Barrett & Fry, 2008) line of questioning was used to focus the participant on the positive aspects of the jurisdiction's efforts and identify the skills and equipment essential in making the disaster response effective. The theory behind *appreciative inquiry* is to emphasize what might be or should be possible to achieve. The method does not attempt to identify and focus efforts on solving past shortcomings; fixing past failures only incrementally improves the existing process (Barrett & Fry, 2008). *Appreciative inquiry* is intended to spark creativity by envisioning future possibilities; thereby, moving an organization beyond just incremental improvement of the status quo. The application of *appreciative inquiry* to these preparedness problems is novel.

Focusing the study on past failures or areas of a response that need improvement limits what can be achieved. Fixing the existing problems will only result in achieving the status quo, at best. If all possible problems can be fixed, thereby resulting in a near perfect response effort during the next event, the responding agency can only achieve the level of success known today. *Appreciative inquiry* makes it possible to imagine what might be (Barrett & Fry, 2008). Articulating and envisioning a higher level of success provides response organizations the possibility of achieving more.

In addition to the advantages of the *appreciative inquiry* method advocated by Barrett and Fry, the approach provided participants a measure of ease. By focusing on the successful parts of the EMS response, and not focusing on failures, participants were likely to provide candid answers to the interview questions. One participant commented that he would not have participated in this study if the research method focused on failures and shortcomings of the response. Using the *appreciative inquiry* approach facilitated access to knowledge held by an emergency responder that otherwise would not have been available to the researcher.

D. DATA ANALYSIS METHODOLOGY

As mentioned, the verbal interviews were recorded and transcribed into text. Each interview was transcribed word-for-word as recorded, resulting in 43 single-spaced pages of transcripts. A four-step data analysis process described by Leedy and Ormrod (p. 140) was used for this study. Step 1—Transcripts were reviewed multiple times and statements relating to skills and equipment used in the response effort were identified; this was a manual search for similar themes. Step 2—Relevant statements containing similar meanings or themes were then categorized. The initial categories identified were as follows.

- Most Valuable Skills
- Situational Awareness
- Relationships
- ICS/NIMS, Mutual Aid
- Confidence

- Devine Intervention (the unexplainable)
- Three Wishes for the Future
- Tools and Equipment
- Personal Challenges and Difficulties
- Accomplishments/Outcomes

Step 3—The researcher used interpretive skills to understand the various ways people experienced the disaster response activities. Again, commonalities were identified in an attempt to define the most prevalent themes in the categories. Step 4—A composite was constructed from the analyzed and interpreted data to describe the skills and equipment needed to perform EMS roles successfully during a disaster.

Any time data is analyzed and interpreted, bias must be considered a factor in the researcher's conclusions (Leedy & Ormrod, 2005, p. 208). It is acknowledged that this research is unlikely to be free from bias. Interviews were more than words transcribed on a page; they were conversations. The conversations were undoubtedly influenced by the researcher's and participants' tone of voice, personalities, and interaction. Reading the transcripts to identify statements relevant to the research involved interpretation and judgment by the researcher. Further, the researcher had no personal first-hand experience with disaster response, and the lack of experience may color the way participants' statements were interpreted. No effort was made to select a sample size of events (11) and participants (10) to interview that could be considered statistically significant. Rather, the number of interviews was based more on convenience and availability. It is likely impossible to conduct qualitative research without inherent risks of personal bias; the results and findings of this research undeniably contain some influence of bias. Yet, every effort was made by the researcher to interpret and analyze the data objectively.

V. OVERVIEW OF EVENTS, ACTIVITIES, ACCOMPLISHMENTS, AND CHALLENGES

A. INTRODUCTION

As detailed in the methodology chapter, the process and structure of the research has been documented. Chapter V provides some detail about each disaster event. To understand the findings of this research better, it is important to understand the context with which disaster is used and defined in this study. A brief description of each disaster event included in this research follows. Descriptions were assembled from interview transcripts, newspaper articles, and other reports and publications. Where possible, descriptions of the activities, accomplishments, and challenges facing the EMS personnel are given. Events are listed chronologically from oldest to most recent. See Table 5-1.

Understanding the setting of each disaster and understanding the challenges each person performing the LEMSA duties faced is important background information. This knowledge helps to grasp how and why certain skills and tools were used in the response. Further, it helps to illustrate how specific activities led to accomplishments. Chapter V builds the background information that leads to the findings identified in Chapter VI.

Event Name	Location	Date of Event
Hyatt-Regency Sky Bridges	Kansas City, MO	July 17, 1981
Alaska Air 261 crash	Ventura, CA	January 31, 2000
9/11 Pentagon attack	Arlington, VA	September 11, 2001
San Simeon earthquake	San Luis Obispo, CA	December 22, 2003
La Conchita landslide	La Conchita, CA	January 10, 2005
Beverly Healthcare Center	Stockton, CA	July 23, 2006
Virginia Tech shootings	Blacksburg, VA	April 16, 2007
San Diego firestorms	San Diego, CA	October 2007
Chatsworth Train Collision	Chatsworth, CA	September 12, 2008
Hwy 101/Soledad Bus Crash	Soledad, CA	April 28, 2009
Jesusita Fire	Santa Barbara, CA	May 2009

Table 5–1. List of Disasters Included in the Study

1. Hyatt-Regency Sky Bridges Collapse

Kansas City, Missouri, July 17, 1981—Louis Cox, director of emergency medical services in Blue Springs, Missouri, acting director of Mid-America Regional Council for Emergency Rescue (MARCER)

According to Robert Price, reporter for the Bakersfield Californian newspaper who interviewed Louis Cox years after the disastrous event (Price, 2006),

> Cox…worked the scene of what was then one of the country's most horrific high-rise accidents. Cox was the director of emergency medical services in Blue Springs, Mo., when on July 17, 1981, he was summoned to the 40-story Hyatt Regency Hotel in Kansas City, Mo. Two 'sky bridges' crowded with people had collapsed into the hotel's six-story lobby, where 1,500 people partied at a Friday-night 'tea dance.' Some 114 people died; scores were injured, many grievously. 'People would dance on these catwalks, and that night they just came down, one on top of the other,' Cox said.

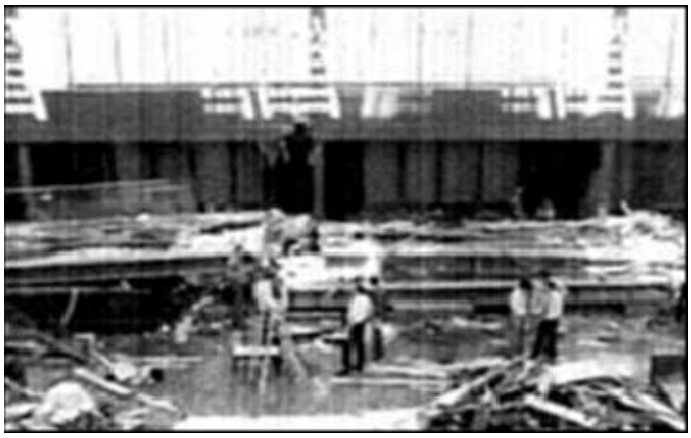

Figure 5–1. Hyatt-Regency Skywalk Collapse (From: Ford, 2006)

One hundred and thirteen people were killed, and 174 people were transported by ambulance with injuries ranging from very critical to moderate (L. Cox, personal communication, May 21, 2010). When asked about the EMS organization's accomplishments that night, Cox said, "we got people moved, we got people to hospitals safely, we saved lives, and we reduced suffering; that's the part we played" (L. Cox, personal communication, May 21, 2010). The most prevalent threat to this part of

Missouri came from tornados. Consequently, all of the emergency response agencies had exercised and planned for a tornado event (L. Cox, personal communication, May 21, 2010). Cox said,

> No one had planned for this type of disaster. You can see the people trapped under the concrete, you could see the people trapped, and they were trying to use forklifts but they weren't moving any concrete at all. They were trying to use butter, they were trying to use grease, they were trying to use anything they could to dislodge them from under the concrete. They tried a lot of things to get people out of there. There was a man trapped that thought he was going to die, so they got a chainsaw and they cut his leg off with a chainsaw. (L. Cox, personal communication, May 21, 2010)

Many people were injured in this event. Although the structural failure was not an act of terrorism or a natural disaster, it was a disaster. Local resources were overwhelmed, and mutual aid from the surrounding area and region were required to assist in rescuing victims in a timely manner.

2. Alaska Airlines Flight 261 Crash

In the Pacific Ocean off the coast of Ventura, California, January 31, 2000—Julie Frey, former EMS Coordinator for Ventura County Emergency Medical Services Agency.

> On January 31, 2000, about 1621 Pacific standard time, Alaska Airlines, Inc., flight 261, a McDonnell Douglas MD-83, N963AS, crashed into the Pacific Ocean about 2.7 miles north of Anacapa Island, California. The 2 pilots, 3 cabin crewmembers, and 83 passengers on board were killed, and the airplane was destroyed by impact forces. Flight 261 was operating as a scheduled international passenger flight under the provisions of 14 Code of Federal Regulations Part 121 from Lic Gustavo Diaz Ordaz International Airport, Puerto Vallarta, Mexico, to Seattle-Tacoma International Airport, Seattle, Washington, with an intermediate stop planned at San Francisco International Airport, San Francisco, California. Visual meteorological conditions prevailed for the flight, which operated on an instrument flight rules flight plan. (National Transportation Safety Board)

Figure 5–2. Alaska Airline 261 flight path (From: Geradts, 2009)

At the time of the accident, the EMS agency did not know if there were any survivors. Actions were taken consistent with a full mass casualty rescue operation. According to Frey,

> The EMS disaster coordinator was notified by Los Angeles County EMS at 1640 hrs. The incident was confirmed with OES [*Office of Emergency Services*], and disaster coordinators were called to the EOC [*Emergency Operations Center*] and arrived at 1815 hours. A notification was faxed to each hospital advising them that a plane had gone down but that survivors were not expected to be found. CISM [*critical incident stress management*] plans were initiated around 2100 hrs. I was asked to handle PIO operations for the coroner's office and to support family services, when needed. CISM operations were handled from the EMS office and at CBC base, as needed. (J. Frey, personal communication, June 3, 2010)

3. Pentagon Aerial Terrorist Attack

Arlington, Virginia, September 11, 2001—John White, Assistant Fire Chief, Arlington County Fire Department.

A brief and descriptive account of the attack on the Pentagon is found in the Arlington County After Action Report, as follows:

> At 9:38 a.m., American Airlines Flight #77 crashed into the west side of the Pentagon, just beyond the heliport. It was traveling at a speed of about 400 miles per hour, accelerating with close to its full complement of fuel at the time of impact. The destruction caused by the attack was immediate and catastrophic. The 270,000 pounds of metal and jet fuel hurtling into the solid mass of the Pentagon is the equivalent in weight of a diesel train locomotive, except it is traveling at more than 400 miles per hour. More than 600,000 airframe bolts and rivets and 60 miles of wire were instantly transformed into white-hot shrapnel. The resulting impact, penetration, and burning fuel had catastrophic effects to the five floors and three rings in and around Pentagon Corridors 4 and 5. This act of evil cost the lives of 189 persons in the Pentagon attack, 184 innocent victims, and the 5 terrorist perpetrators of the criminal attack. (Arlington County, Virginia by Titan Systems Corporation, 2001, p. 9)

Figure 5–3. Aftermath of Pentagon Attack (From: Brasscheck TV)

After leaving a training class early because of phone calls from his wife alerting him to the World Trade Center incident, White said,

> …I walked out to my car. As soon as my radio comes on I hear a transmission from an engine company of ours. They had been at a training session and were on their way to a shopping center to do the practical part of the training. From there, on Interstate 395 about a mile south of the Pentagon, they watch flight 93 go in. And, I hear this on the radio. I was thinking ‘oh my gosh’. I flip on my lights pull out into traffic and I find myself in a caravan of police cars and other vehicles from our fire department heading for the Pentagon. I crest the hill looking down at the

> Pentagon, and all I see is a huge column of smoke. I was thinking to myself, okay this is what you have trained 21 years for. (J. White, personal communication, June 17, 2010)

"9:55 a.m. Assistant Chief John White arrives and is assigned EMS Branch Commander" (Arlington County, Virginia by Titan Systems Corporation, 2001, pp. 1–1, Appendix 1). White gave the command to get patients/victims out of the area as soon as possible. Regardless of the patient's extent of injuries, ambulance crews were instructed to *load and go*, meaning transport patients away from the scene and to the hospital without any delay or on-scene treatment. "The burn injuries were unbelievable!" White said (J. White, personal communication, June 17, 2010).

Employees at the Pentagon either self-evacuated or were assisted by other employees in evacuating. White recalled,

> …our people were in the building and were searching, but there were no patients. The only thing we found were the deceased or pieces. I don't know if you have seen some of the pictures of that morning, but there were literally hundreds of military personnel, some were toting backboards, some toting all sorts of other things, and they were bound and determined to go back into that building. I had the distinction of getting on a bullhorn and announcing that I was in charge of this aspect of the rescue, and no one was going back in, because it is not safe. I let them know that our people would bring victims out to a certain point then we may need you as bearers to move the victims to the triage and treatment area. There didn't seem to be any more but the deceased in the building. (J. White, personal communication, June 17, 2010)

One thing particularly noteworthy was that the civilian rescue operation led by Arlington County Fire Department only lost one casualty taken out of the building alive. All of the other victims who were initially rescued alive survived the event. White humbly indicated, "You know, that's what we are all about in EMS—trying to give somebody back there life and health after their medical event or injury" (J. White, personal communication, June 17, 2010).

4. San Simeon Earthquake

San Luis Obispo County, California, December 22, 2003—Tom Lynch, former Emergency Medical Services Agency Director, San Luis Obispo County; was director at the time of this event

A magnitude 6.6 earthquake struck the central coastal area of California on Monday, December 22, 2003 at 11:15 AM. The epicenter was six miles northeast of the town of San Simeon and 24 miles from the city of Paso Robles (U.S. Geologic Survey). USGS reported,

> Two people killed and about 40 buildings collapsed or severely damaged at Paso Robles. At least 40 people injured in the Paso Robles-Templeton area. Buildings damaged and small fires occurred at Cambria and Morro Bay. The airport at Oceano was closed due to cracks in the runway. More than 10,000 homes and businesses were without power in the Paso Robles area. (U.S. Geologic Survey)

The earthquake was felt has far north as Santa Rosa, south as far as Oceanside; it was felt in much of central California and as far east as Bullhead City, Arizona.

> San Simeon was the first incident in years that had a total countywide impact. What made it memorable for me is how everybody stood up for the occasion. Not just the in-county people, but I cannot tell you the number of voicemail's … from other EMS agencies were calling to offer help. People as far away as Los Angeles which was over 200 miles away felt the impact…They then offered any support that we needed. The Regional Disaster Medical Health (RDMH) system kicked in with an official notification from them asking what type of assistance we needed. Everybody including the [*local*] staff person with a broken ankle put all of their personal needs to the side and immediately jumped in to manage the incident. That to me was the most memorable. (T. Lynch, personal communication, Monterey County, May 27, 2010)

5. La Conchita Landslide

La Conchita, Ventura County, California, January 10, 2005—Barry Fisher, former Emergency Medical Services Administrator for Ventura County; was director at time of this event

La Conchita is a small-unincorporated community wedged between the steep coastal mountains and the Pacific Ocean, located just north of the City of Ventura. According to the town's website,

> In 1995 the hill behind La Conchita failed and buried 9 homes but no lives were lost…On January 10, 2005 the hill failed again only this time it killed 10 residents and destroyed 18 homes. The remainder of the community (171 homes) is - according to Ventura County, in peril from any additional heavy rain. (La Conchita Community Organization)

Barry Fisher stated that,

> Rescue operations were taking place while additional equipment and supplies were being moved into our county. Lots of responders and neighbors from La Conchita neighborhood were digging in various areas where they knew people were home at the time of the landslide. The Ventura EMS agency was involved along with ambulance providers, various fire department responders including mutual aid from as far away as the city of Los Angeles, Office of Emergency Services, Sheriff, California Highway Patrol, public information officer, medical examiner and private companies that provided tractors, back hoes, and dump trucks. Ten people were killed which included several small children.

Figure 5–4. Hillside view of La Conchita mudslide (From: La Conchita Community Organization)

> This was a good test of our ambulance mutual aid system with Santa Barbara County AMR and the Santa Barbara County EMS agency. Having good relationships with your neighboring counties comes in handy when disaster strikes. This incident verified that we have a great system in place and can count on our neighbors to respond quickly with no questions asked (B. Fisher, personal communication, May 11, 2010).

6. Beverly Healthcare Center Evacuation

Stockton, California, July 23, 2006—Dan Burch, Emergency Medical Services Administrator for San Joaquin County, and Region IV Disaster Medical Health Coordinator.

Beverly Healthcare Center is a skilled nursing facility (SNF). A SNF is similar to a hospital in that people are admitted who need short-term or long-term care. Patients often are admitted following surgery or some other significant medical event that requires physical rehabilitation and daily oversight. SNF patients are often elderly with fragile medical conditions. The evacuation of the skilled nursing facility was occurring because of the loss of air conditioning. Stockton is a city in central California and daytime temperatures often exceed 100 degrees in the summer months.

Two elderly patients were taken to an area hospital the night before the evacuation event. The patients seemingly suffered from heat-related illness primarily due to the facility's air conditioning failure earlier that day. One patient died. Dan Burch indicated,

> This happened from a Friday night where a couple of patients were sent in to this non-base hospital with heat illness. The physician was saying there is something wrong at this care facility, and he called law enforcement, and said there is something wrong with the care being provided at facility, and you need to go check on it. So, law enforcement turfed it to the fire department and the fire department realized that the facility did not have air conditioning. Therefore, they made the determination that it had to be evacuated. (D. Burch, personal communication, May 28, 2010)

The EMS agency became involved on Saturday at about 5:30 in the morning. Serving as the EMS director and the Regional Disaster Medical-Health Specialist (RDMHS), Burch helped bring order into chaos by becoming involved through a runaway mutual aid incident. Burch said,

> When I got called, there was a request from the field for an additional 50 ambulances. The facility had about 200 people that needed to be evacuated…Basically, their [*Stockton Fire*] mutual aid request was for one ambulance for every person…As I got involved with this incident and canceled those mutual aid resources, it turned out to be one of the most important things that we did. (D. Burch, personal communication, May 28, 2010)

All patients were evacuated in an orderly and deliberate manner to other skilled nursing facilities throughout the region over the period of a couple of hours. In addition, ambulance resources throughout the region were not drained in the process. Repairs were made within a few days to the facility, and patients began returning to the SNF within one week. Burch said, "there were no bad outcomes as a result of the evacuation even though many of the patients were fragile. No one was injured during the evacuation" (D. Burch, personal communication, May 28, 2010).

The following year, the State of California fined Beverly Healthcare Center $80,000 because of poor care (California Department of Public Health, 2007).

7. Virginia Tech Shootings

Blacksburg, Virginia, April 16, 2007—Neal Turner, Emergency Services Coordinator, Montgomery County

"On April 16, 2007, one student, senior Seung Hui Cho, murdered 32 and injured 17 students and faculty in two related incidents on the campus of Virginia Polytechnic Institute and State University ('Virginia Tech')" (Governor Kaine, Commonwealth of Virginia, 2007). Neal Turner was responding to the incident, and he recalled,

> …the day of the shooting the population [on campus] was about 34,500 people. That equates to 26,700 students, 9,000 of which live on the campus dorms; 7133 employees, that is not counting student employees; about 1,000 visitors and contractors, and transit workers and other folks. It

> is a huge and beautiful campus…The campus itself is comprised of over 131 buildings; the campus is made up of about 2,600 acres (about 4 square miles). Now, that is just the main campus…There is probably another 10,000 acres that Virginia Tech owns around the area. There are 16 road entrances to the main Virginia Tech campus…It is not a facility that can be easily secured.

Figure 5–5. Students gather at Virginia Tech memorial service (From: Governor Kaine, Commonwealth of Virginia, 2007)

Montgomery County has an all-volunteer fire and rescue configuration. There are five paid personnel throughout the county: a paid fire chief, a paid rescue chief in Christiansburg, a fire code official, a fire prevention officer in Blacksburg, and the emergency coordinator. This comprises all only-paid staff throughout Montgomery County, other than some private ambulance services. Upon understanding the scope of the event, "we assembled, within 20 minutes, 40 law enforcement agencies, 27 ambulances, along with 120 volunteer rescue personnel …That to me was phenomenal" (N. Turner, personal communication, June 18, 2010).

Turner recalled the following,

> I was called that morning, called by the Virginia Tech rescue squad, with initial reports of shots being fired in Norris Hall. It was well known that Norris Hall is a teaching facility on the campus; it was a classroom. There were laboratories on the first floor and classrooms on the second floor, so it was a heavily populated building…My function from the time I left the office to the time I got there was to put out an all call; a call to all fire departments and all rescuers, we needed all of the EMT personnel that we could assemble. If you know anything about emergency services, then you know I was the guy screaming in the radio saying that we need all kinds of

> resources…If you ever, and I pray to God that you can't, imagine that you have just been called to a war zone in your hometown—that ain't [*sic*] supposed to happen. It is un-imaginable. When I got there, there were initial reports that there were nine or 10 that had been killed. Of course, that number continued to rise throughout the morning until we reached 30 people…The most I have ever seen at any one event is four people. To imagine 30…Well, I don't want to imagine it. (N. Turner, personal communication, June 18, 2010)

8. San Diego Firestorms 2007

San Diego, California, October 2007—Marcy Metz, Chief of Emergency Medical Services for San Diego County

> The 2007 San Diego County Firestorms started on October 21, 2007, near the U.S./Mexico border at 0930 Pacific Standard Time (PST). The fires burned throughout San Diego County until the last fire was fully contained on November 9, 2007. (County of San Diego, by EG&G Technical Services, Inc., 2008, p. X)

Figure 5–6. Firestorms of San Digeo (From: SDradio.net, 2007)

The Harris Fire was the first of the 2007 wildfires; it burned 90,440 acres before it was contained. The Witch Creek Fire started just after the Harris Fire. With reported winds of more than 100 miles per hour (mph) in some areas, the fire jumped over Interstate 15. The Witch Creek Fire burned a total of 197,990 acres, making it the largest of the 2007 wildfires. The Rice Canyon Fire started the next day on October 22, 2007. It burned 9,472 acres and caused the closure of I-15 and thousands of evacuations in the

northern part of San Diego County. Later the same day, the Poomacha Fire started as a structure fire on the La Jolla Indian reservation. The fire quickly spread to Palomar Mountain where it joined the Witch Creek Fire and entered the Agua Tibia Wilderness. The Poomacha Fire burned 49,410 acres and was not fully contained until November 9, 2007. It was the last fire of the 2007 wildfires to be contained. Other wildfires of the 2007 San Diego County Firestorms included the Marine Corps Base Camp Pendleton Fires (the Wilcox Fire, the Ammo Fire, and the Horno Fire), as well as the Coronado Hills Fire, the El Capitan Fire, and the McCoy Fire. (County of San Diego, by EG&G Technical Services, Inc., 2008, p. X)

> The 2007 fires resulted in 10 civilian deaths, 23 civilian injuries, and 89 firefighter injuries. It burned a total of 368,340 acres, destroyed an estimated 1,600 homes; 800 outbuildings; 253 structures; 239 vehicles; and 2 commercial properties. More than 6,200 fire personnel fought to control the 2007 fires. Almost all public schools in San Diego County were closed, as were many businesses. Some of the major freeways were shut down for periods of time, and county residents were strongly encouraged to stay off the roads. (County of San Diego, by EG&G Technical Services, Inc., 2008, p. X)

"During the entire course of the 2007 fires, 515,000 county residents received voluntary or mandatory evacuation notices, which exceeded the number of residents evacuated from New Orleans during Hurricane Katrina," (County of San Diego, by EG&G Technical Services, Inc., 2008, p. X). The EMS agency operates the Medical Operations Center (MOC), which is the countywide coordination center for medical and health resources. The MOC managed the evacuation of three hospitals, which included one psychiatric hospital, and 12 skilled nursing facilities. In all, approximately 2,000 patients were evacuated in one day.

Several skilled nursing facilities were forced to evacuate because of the approaching fire (Wooten). Patients were placed at the county fairgrounds, which served as a temporary staging area until more suitable quarters could be found. It was estimated that the staging area would be used for four to eight hours (Bruce E. Haynes, 2007). Being a temporary staging area, accommodations were sparse; mattresses were placed on the floor.

Patients were eventually placed at other skilled nursing facilities and distributed throughout San Diego and Orange counties (M. Metz, personal communication, June 23, 2010). In addition, "we put the hospitals on alert. We want to give them notice about respiratory and cardiac emergencies that may be coming from the area of the fire" (M. Metz, personal communication, June 23, 2010). Metz commented on the experience. She said,

> When the fire jumped the freeway at three locations, the winds were blowing at 80 or 90 mph. It was truly a firestorm of proportions we had never seen before. You drive through this thick smoke and ash. You have to put the windshield wipers on to get rid of the ash on the windshield so you can get around. You pull off the exit and then there would be roadblocks, and you can see the fire burning just a few feet away. Yet, we have to go into this area. You fear for family, and friends, and property. But, you also know that you have that responsibility to go there and work and help and aid in the evacuation of others. We were doing what we can for our county. (M. Metz, personal communication, June 23, 2010).

9. Chatsworth Train Collision

Chatsworth, California, September 12, 2008—Cathy Chidester, Emergency Medical Services Agency Director, Los Angeles County

> About 4:22 p.m., Pacific daylight time, on Friday, September 12, 2008, westbound Southern California Regional Rail Authority Metrolink train 111, consisting of one locomotive and three passenger cars, collided head-on with eastbound Union Pacific Railroad freight train LOF65–12 near Chatsworth, California. The Metrolink train derailed its locomotive and lead passenger car; the UP train derailed its 2 locomotives and 10 of its 17 cars. The force of the collision caused the locomotive of train 111 to telescope into the lead passenger coach by about 52 feet. The accident resulted in 25 fatalities, including the engineer of train 111. Emergency response agencies reported transporting 102 injured passengers to local hospitals. (National Transportation Safety Board, 2010, p. vii)

> There were 222 passengers aboard Metrolink 111, and the trains collided at approximately 40 miles per hour. (Fujioka, 2009, p. 2)

Los Angeles County has is a large population center. As such, the county has a significant number of EMS resources. Consequently, this incident was not considered a

local disaster because the resources were not actually overwhelmed. Mutual aid from outside the jurisdiction was not requested. Rather, this incident is categorized as large multi-casualty incident (MCI) (C. Chidester, personal communication, May 27, 2010).

Figure 5–7. Aerial view of Metrolink collision site (From: Mata, 2008)

Los Angeles County has a centralized EMS resource communication center, called the Medical Alert Center (MAC). The MAC serves as the central point of contact between all medical resources, hospitals, etc. and the EMS agency. During MCI events, the MAC directs the destination of ambulances to specific hospitals in the region (C. Chidester, personal communication, May 27, 2010).

County EMS director Chidester said,

> I was in the Medical Alert Center watching patient distribution, and that's when I had that moment of pride. It was apparent that the patients were actually being distributed as we had planned. There was not any one hospital that was being overwhelmed and inundated, and the trauma patients were getting to trauma centers. When we found out that all of the patients except for one had survived the train accident [*at that point in time*]…I was really proud of that, and the distribution. To realize that patients were actually being distributed—it was gratifying.
>
> I went into the MAC. It was in our policy at the time that an administrator respond to the MAC…When I went in I saw that the dispatchers were doing their jobs but they did need someone from administration who had critical contact information for the fire chiefs…Hospital contacts were going on around me, and then we were getting calls from hospital licensing, and they wanted to get information on what was going on;

> licensing was hearing rumors about hospital overcrowding and that Holy Cross could not take any more patients…So, all of a sudden licensing was there and the news media kept calling. We got a call from the BBC; how did they get our number? I had been asked to be call my boss, and the Board wanted a memo about what's going on, that type of thing. And then the state calls, and you have to deal with that. So, you really have to have an administrator there to be dealing with all of these other side issues, not necessarily with the patients. (C. Chidester, personal communication, May 27, 2010).

10. Highway 101/Soledad Bus Crash

Soledad, California, April 28, 2009—Tom Lynch, former Emergency Medical Services Agency Director, Monterey County; was director at the time of this event

On April 28, 2009, a large Multiple Casualty Incident (MCI) occurred on the Highway 101 overcrossing of Front Street in Soledad. A chartered tour bus carrying French citizens traveling south through Monterey County crashed. The bus hit the guardrail, spun around, and rolled over onto its side ejecting many people from the bus. Four passengers were thrown off the overpass and landed next to the railroad tracks below the bridge. Three people died immediately from this crash (Monterey County EMS Agency, 2009, p. 3). The bus carried 35 passengers plus the driver, and the majority of the patients did not speak English (Monterey County EMS Agency, 2009, p. 6).

Figure 5–8. Scene of Hwy 101/Soledad bus crash (From: Monterey County EMS Agency, 2009)

> The tour guide was identified approximately 45 minutes into the incident. She stated that there were 34 people in the group not including herself and the driver. Compounding the difficulty in determining the number of patients were the field workers who came to the scene from the adjacent field to assist. Some of these bystanders had blood on them and they were initially identified as patients. (Monterey County EMS Agency, 2009, p. 8)

"As the incident progressed, multiple aircraft congested the sky above the incident. The aircraft included seven air ambulances, many news helicopters, and a CHP airplane" (Monterey County EMS Agency, 2009, p. 6). This was a multi-discipline and multi-jurisdictional response. Responding agencies included: one ground ambulance company, three air ambulance companies, 12 fire departments, five law enforcement agencies, 10 hospitals, four dispatch centers, and the County EMS agency (Monterey County EMS Agency, 2009, p. 5).

> The incident near Salinas was kind of dynamic because we just completed a total revision of our MCI plan. We were in the process of implementing it; there had been some train-the-trainer activity. But, a number of the people who had worked on the plan were at the incident. Even though the plan was not yet fully in effect because we had not yet completed all of the training, the people at the incident adopted elements of that plan and began implementation through this incident. They helped manage this incident quite effectively. (T. Lynch, personal communication, Monterey County, May 27, 2010)

11. Jesusita Fire

Santa Barbara, California, May 2009—Nancy Lapolla, Emergency Medical Services Director and Manager of Public Health Preparedness for Santa Barbara County

The Jesusita Fire, so named after Jesusita Creek where the fire began, threatened the City of Santa Barbara and several unincorporated communities. At the fire's peak, 500 homes were in danger, 80 homes were destroyed and 15 others were damaged. One commercial property and 79 outbuildings were destroyed. The fire eventually burned 8,733 acres. Several areas of Santa Barbara were evacuated during the fire (Boyer, 2009, p. 1).

Figure 5–9. Jesusita Fire burning towards Santa Barbara (From: Bill, 2009)

In the most demanding evening of the fire, Santa Barbara County EMS Agency opened an alternate care site to serve medically fragile patients. At the same time, the agency was coordinating the evacuation of a skilled nursing facility and coordinating all medical transportation needs of individuals in the evacuation area. Warnings had been issued that the level 2-trauma center and multiple other skilled nursing facilities were in the path of the fire and might need to be evacuated.

> It was important for us to communicate with law enforcement so that they understood moving people out of these facilities may cause them to die; we wanted to make sure there is no mandatory evacuation unless it was absolutely necessary. (N. Lapolla, personal communication, June 2, 2010)

EMS Agency director Nancy Lapolla recalled,

> You have to understand, the Jesusita fire was threatening all of Santa Barbara downtown. Half of the side of State Street [the main downtown commercial street] was under evacuation orders; there was a fear the fire would spread that far. We were getting inundated with phone calls constantly from senior retirement…special-needs facilities. Some of these facilities were all the way down to the water—the warning extended that far. It was the whole city of Santa Barbara. That night over 40,000 people were evacuated. (N. Lapolla, personal communication, June 2, 2010)

As a result of the evacuation order, the county emergency operations center (EOC) and the EMS Agency department operations center (DOC) had to be evacuated and relocated. Both operations were moved from downtown to the University of California, Santa Barbara campus north of the city. The evacuation of the downtown facilities did not go flawlessly. Lapolla said,

> So here I am at the Public Health Department building after midnight. No power—all by myself, looking for the DOC staff, and I'm the only one here. So, I was in this building with a flashlight trying to evacuate the building and it was an eerie scary feeling. They had left and nobody told me. They didn't wait as instructed for my car. Anyway it was kind of a spooky thing.
>
> The next day at the medically fragile shelter, we had all these Alzheimer's patients and we didn't know who they belonged to. We didn't know who they were or where they belonged. Neighbors just drop them off, and the patients could not really communicate with us. Eventually, the neighbors came back for them. But, it was unsettling not knowing anything about them. (N. Lapolla, personal communication, June 2, 2010)

B. SUMMARY

Eleven disastrous events have been profiled. Some of the events had only local impacts, some had regional impacts and others had nation-wide impacts. In each profile, the circumstances and nature of the disaster is described. Outcomes and challenges are identified. For that person, for that day, this was the scenario they faced. This information is provided to establish the context for each person’s answers and opinions to the survey and interview questions.

The next chapter identifies the specific findings from the surveys and interview as the information pertains to the research question. The findings show some clear commonalities between the varied disastrous events. The findings reveal common functions, competencies, skills, and tools used by LEMSAs in response to disasters, and this information is used to construct a framework for disaster preparedness.

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VI. ANALYSIS AND FINDINGS

A. INTRODUCTION

Events described in the previous chapter provide the context to understand the circumstances, outcomes, and challenges each person interviewed for this research faced during the disaster. In Chapter VI, the specific findings relevant to the research question are identified.

To understand preparedness, the roles or functions that need to be performed must be identified. It is not possible to be prepared if the situations for which each person is preparing are unknown. The core EMS disaster response roles are identified. Ten specific functions were found to be common among many of the events researched. Performing the functions requires some level of knowledge or prerequisites to having the ability to do the job. Two overarching competencies or knowledge base are identified along with three specific skills. The knowledge and skills identified as being essential were commonly used as part of the response to most of the disaster events. Specific tangible items, described as tools and equipment, most useful in performing the core EMS disaster response roles have also been identified.

B. CORE EMS DISASTER RESPONSE ROLES

According to the California Emergency Medical Services Authority, as shown in Table 4-2, three broad categories of functions exist that EMS agencies can be expected to perform during a disaster, as follows.

- Assessment of Immediate Medical and Health Needs
- Coordination of Patient Distribution and Medical Evacuation
- Coordination of Disaster Medical and Health Resources

The three broad categories are important in organizing activities and workload within an agency from an administrative perspective (California Emergency Medical Services

Authority, 2003). Yet, in preparing for a disaster, it is important to look deeper. Understanding the importance of specific roles is necessary for adequate preparedness.

As mentioned in Chapter IV, the survey used in this study contained two distinct parts. The first part consisted of a normative survey containing 27 statements that represent the core EMS disaster response functions (California Emergency Medical Services Authority, 2003). See Table 4-2 and Appendix A. Participants were instructed to select all of the items from the list that they performed during their event. Responses to these series of closed-ended questions can be used to determine if some of the core functions are common among the various types of events. Responses were tallied and the results indicated that, in fact, some of the core response functions were used more often than others. Table 6-1 lists each core EMS disaster response role along with the percentage of incidents in which each function was performed.

It was found that establishing effective, reliable interoperable communications between EMS, incident command, public health, and healthcare facilities was a function used by every EMS agency during each disaster. This finding is significant because it indicates that establishing interoperable communications will likely be needed in every disaster event in the future. In regards to disaster preparedness, having the ability to perform this role is critically important to a response effort.

The next most important core EMS functions were: 1) activating the Disaster Medical and Health System and notification of key positions; initiating recall to staff spare ambulances, and provide immediate surge capability; 2) assessing the need for additional medical resources (mutual aid); and 3) having the ability to acquire, allocate, mobilize and support additional resources (mutual aid). These three functions were performed in 90 percent of the disasters studied. The last two items are related to mutual aid. Having sufficient situational awareness to understand if mutual aid is needed appears to be important in addition to the ability to manage the mutual aid resources.

Being able to develop awareness of the situation and passing that information to others in the command chain was performed in 80 percent of the events. Situational awareness is not only a frequently used core EMS function, but as discussed later, situational awareness is a fundamental skill that is essential to disaster response.

The next three core functions were used in 70 percent of the responses to disasters. They are: 1) activating medical surge plans, procedures, and protocols; 2) managing pre-hospital patient distribution and tracking; and 3) tracking use and assignments of personnel, equipment, and other non-disposable medical resources. A disaster can partly be defined as an event that overwhelms the resources in the system. These three functions are all related to managing more patients and more resources than can normally occur. Tracking patient locations and the status of resources are frequently performed EMS roles during a disaster.

Orig. Order	Core EMS Disaster Response Role	Percent
4.	Establish effective, reliable interoperable communications between EMS, incident command, public health, and healthcare facilities	100
1.	Activation of the Disaster Medical and Health System and notification of key positions; initiate recall to staff spare ambulances and provide immediate surge capability	90
17.	Assess need for additional medical resources (mutual aid)	90
18.	Ability to acquire, allocate, mobilize and support additional resources (mutual aid)	90
5.	Develop situation status information and report status to appropriate channels/levels	80
3.	Activate medical surge plans, procedures, and protocols	70
7.	Manage pre-hospital patient distribution and patient tracking	70
15.	Track use and assignments of personnel, equipment, and other non-disposable medical resources	70
2.	Transformation of pre-hospital system to disaster status	60
14.	Maintain an EMS resource inventory for the system	60
8.	Coordinate the establishment of temporary Field Treatment Sites (FTS); designate, manage and support FTS	40
12.	Coordinate evacuation of casualties to outside the area if the local capacity is exceeded	40
16.	Provide medical support, safety considerations, and Personal Protective Equipment (PPE) for EMS responders and hospitals	40
20.	Manage support to hospitals; ensure adequacy of medical equipment and supplies in support of immediate medical response operations and for restocking supplies/equipment requested	40
6.	Coordinate triage and pre-hospital treatment operations with on-site Incident Command	30

Orig. Order	Core EMS Disaster Response Role	Percent
9.	Manage facility-to-facility transfers (interfacility transfers)	30
19.	Activate healthcare workers' and volunteers' call systems	30
22.	Manage support to other health facilities; coordinate with alternative emergency medical providers (clinics, skilled nursing facilities)	30
10.	Coordinate the evacuation from damaged or overwhelmed medical facilities	20
11.	Activate alternative care sites and overflow emergency medical care facilities to manage hospital surge capacity	20
21.	Coordinate acquisition of private source medical supplies	20
25.	Ensure the timely provision of medical supplies to shelters and mass care and medical facilities	20
26.	Provide personnel for shelters and mass care and medical facilities	20
27.	Implement austere medical care standards, as appropriate, to manage mass casualty events	20
13.	Coordinate receiving of casualties from other jurisdictions (providing mutual aid)	10
23.	Monitor supply usage and stockpile levels of health facilities, mass prophylaxis sites, and other critical care venues; process and manage requests for additional medical supply personnel or equipment	10
24.	Request Strategic National Stockpile assets from Centers for Disease Control	0

Table 6–1. Percentage of Events that Core EMS Disaster Response Role was Performed

Transforming the pre-hospital system to disaster status was used in 60 percent of the events. This transformation is an important, deliberate decision because it significantly affects operations. EMS systems typically have sufficient resources to manage day-to-day routine emergencies. Full uses of all system resources are devoted to the rescue and response of one or a few incidents in any given day; extraordinary efforts are made to care for the individual. In a disaster, the operations of the EMS system must be switched to achieving the greatest good for the greatest number of people with the available resources; the focus is no longer on the individual. Changing to disaster mode only occurs when it is known that not enough resources are available to operate in the standard routine manner. Perhaps, the finding that EMS systems changed to disaster mode in 60 percent of cases studied is an indicator that the local EMS agencies did not consider 40 percent of the cases to be disasters.

Maintaining an EMS resource inventory for the system was used in 60 percent of the events. Knowing the number and type of resources available appears to be an important element in successfully responding to a disaster, and this information will help to build an accurate situational awareness.

Of the 27 core EMS disaster response functions, 10 core functions were used more frequently than the others. These 10 were described above. The remaining 17 core functions were used in less than half of the events. Any one of the 27 core functions may be the most important role during a disaster, given the right circumstances. For example, it should be noted that Function No. 24—*Request Strategic National Stockpile assets from Centers for Disease Control*, was not used by any LEMSA. However, none of the disasters included in the study involved a biological attack or chemical emergency. Another example is Function No. 13—*Coordinate receiving of casualties from other jurisdictions (providing mutual aid)*. No one interviewed was in the position of receiving casualties from a neighboring disaster. If the disasters included in the study involved a response from this perspective, it is posited that these functions may have scored significantly higher. The nature of the event will influence which of the core functions are likely to be used more often than the others.

Six of the disasters included in this study involved relatively small numbers of victims: 50 to 222. The other five disasters impacted 1,500 or more people. In analyzing a smaller disaster, defined here as less than 250 victims against a larger disaster, and defined here as more than 1,500 people affected, a significant difference in the order of importance of the 27 core EMS disaster response functions does not appear to exist. The results do indicate, however, that more of the 27 functions are used when the event is a larger disaster.

In the events included in this study, 17 of the functions were performed less frequently than the others. This is a significant finding. It indicates that in regards to general disaster preparedness of a local EMS agency, building the capabilities to perform the top 10 core EMS functions may place the organization in an advantageous position if a disaster strikes. It may be prudent to devote resources to build competency at performing the top 10 core EMS functions before the other seventeen. In other words, a

greater likelihood exists that the top 10 core EMS functions will be used in a disaster. Therefore, to achieve an adequate level of disaster preparedness, local EMS agencies should develop the competency to perform these 10 functions, at a minimum.

C. SKILLS NEEDED TO SUCCESSFULLY RESPOND TO A DISASTER

One segment of the research question to be explored in this thesis was to identify the skills a LEMSA needed to fulfill its role successfully in responding to the needs of the community during a disaster. Open-ended interview questions were used to elicit responses that might identify specific skills. All responses were analyzed as described in Chapter IV.

Five specific competencies were identified as being the most important in successfully responding to a disaster. They are listed below in order of importance. Importance was determined quantitatively from the interview data. There were seven interview questions, and each time a specific skill was mentioned in a response to a question, it was tallied. For example, the highest score possible for any one particular skill in one interview would be seven, e.g., once per question, or 77 for all eleven incidents. If a skill was mentioned during the response to one interview question, it was tallied once, but not counted again for that question. Counting responses in this manner was used to maintain objectivity. If a respondent were to mention situational awareness eight times in response to one question, the overall mathematical results would be skewed too heavily on one person's opinion. The researcher avoided skewing the results by only counting a skill one time per question. All skills were then tallied for all interviews, and the results revealed the following as the five most important skills.

1. Experience (score of 16)
2. Preplanning (score of 15)
3. Relationships (score of 9)
4. Incident Command System (ICS)/National Incident Management System (NIMS)/ Mutual Aid (score of 8)
5. Situational Awareness (score of 6)

Five other skills were identified and mentioned in the interviews by individuals. Yet, only one person mentioned these five other skills. In other words, all of the other skills identified had a score of one (1) from the open-ended interview questions. The other five skills are geographic information system proficiency; ability to process and use medical volunteers (physicians); having technical ability to set-up interoperable communications equipment; having an EMS data system for real-time information flow; and having a hospital data system for real time information flow. The lack of repetition makes it difficult to conclude that these other skills can be applicable in a broader context. Perhaps, in a larger sample size, the results might be different. However, the results of this study indicate a lack of common applicability for these other five skills.

1. Experience and Preplanning

It was awkward to describe and categorize experience and preplanning as skills. A skill is "…something, especially a trade or technique, requiring special training or manual proficiency" (skill). Experience on the other hand is "knowledge or practical wisdom gained from what one has observed, encountered, or undergone" (experience). Preplanning is "a scheme or method of acting, doing, proceeding, making, etc., developed in advance" (preplanning). Perhaps experience and preplanning are better referred to as underlying competencies or knowledge base. Whereas, the ability to build and maintain relationships, use standardized command structure processes, and construct situational awareness can more easily be described as skills.

The two most important underlying competencies or knowledge base needed in successfully responding to disasters is experience and preplanning. Experience as described in this context is having participated in a disaster response in the past and/or having participated in a sufficient number of drills and exercises where personnel have confidence in their abilities to perform the functions.

Obviously, disasters are not everyday occurrences; they are rare events. LEMSA personnel may work an entire career and not have first-hand disaster response experience. Consequently, facing an actual disaster may be a daunting challenge—the fear of the unknown. Having experience working in disastrous circumstances allows EMS

responders to understand what is expected of them and they can build the knowledge based on actions and decisions that achieved the best outcomes. Having experience also boosts the confidence of responders. One respondent offered,

> You have to revert to your training and experience. That ongoing routine training got people comfortable in their roles. It comes down to having confidence to make the decisions. I know that I have been trained on technology, and I can function with that technology. This knowledge gives me the confidence to be able to perform well during a large-scale event and be effective. (T. Lynch, personal communication, Monterey County, May 27, 2010)

Another respondent stated,

> First and foremost: experience. Having experience with emergency response for the majority of your lifetime, you go back and subconsciously in the archives of your mind you draw on that experience. It's just huge. (N. Turner, personal communication, June 18, 2010)

The firestorm of 2007 in San Diego was not the first time the EMS agency contended with this type of disaster. EMS Chief Marcy Metz said the prior event in 2003 improved the response capabilities in 2007, "…my experience in the emergency field, having been through the 2003 fires, and knowing what to expect" (M. Metz, personal communication, June 23, 2010). Wildfires have been repeated disasters in Santa Barbara, as well. EMS Agency Director Nancy Lapolla informed,

> I think it was having plans in place and having practiced those plans…We have done this before. This is not our first fire. We have had other fires at a smaller scale. So we had the opportunity to exercise our plans, use our maps, practice how we communicate and help coordinate calls. (N. Lapolla, personal communication, June 2, 2010)

One need not have first-hand disaster response experience to be adequately prepared for a disaster. Training, exercises, and drills can be a substitution to achieve adequate preparedness. Metz stated, "exercises and drills. Practice, practice, practice is the key to having staff that feel confident and competent when an event like this happens" (M. Metz, personal communication, June 23, 2010). A similar response was provided from Los Angeles County when questioned on ways to achieve disaster

response success in the future, “implement frequent ongoing training on the policies and procedures, and drills with the medical alert center and with field personnel” (C. Chidester, personal communication, May 27, 2010). An analogous response came from the East Coast. Arlington County Assistant Fire Chief White said,

> I think it would make the most sense to spend additional resources on more simulations…It would be good to have the students walk through what they would do. Their decision-making process gets better the more it's practiced, and can be practiced with simulation drills. (J. White, personal communication, June 17, 2010)

Preplanning in the context of this study means having pre-prepared mass-casualty disaster response plans based on the likeliest threats to the jurisdiction, and continually updating and improving disaster response plans based on lessons learned from debriefings of new multi-casualty incidents. Respondents reiterated numerous times the importance of having a pre-prepared disaster response plan.

> If the first time you have ever thought about the emergency is during the emergency then the event will be a disaster... Having a plan in place was useful; it did not have to be created on-the-fly during the event. This was extremely useful. (Burch, 2010)

Certain types of natural disasters exist in which a jurisdiction can anticipate being a realistic threat. For example, jurisdictions in the Southern Sierra Nevada mountain range of California should anticipate wildfires, floods, and earthquakes. However, the likelihood of a hurricane or a tsunami is practically nil.

> Virginia Tech rescue squad had previously planned and exercised a mass casualty drill the previous year, and they had completed their MCI plan and conducted training. To me, that was so invaluable. They had a sense of what we got to do, and this is what we got to do it with. (N. Turner, personal communication, June 18, 2010)

Having pre-made disaster response plans that addressed the likely scenarios was identified as an important component of EMS preparedness. Louis Cox indicates,

> One, you have to have a comprehensive plan; everybody has to know the plan; and everyone has to follow the plan. If you have one section that is not following plan they can ruin everything. (L. Cox, personal communication, May 21, 2010)

Further, analyzing past response actions, applying lessons learned, and updating plans based on those lessons is also an important element of building the knowledge base. Metz advises, "even to this day when we have drills or exercises, and we identify where we need to improve…the lessons learned are just critical as we plan for future events," (M. Metz, personal communication, June 23, 2010). An official from Los Angeles County states, "utilizing lessons learned from every single major incident [*is standard practice*]…We make changes to policy based on the information from major incident debriefings" (C. Chidester, personal communication, May 27, 2010).

2. Relationships

The three most important skills needed to respond successfully to disasters are 1) the ability to build and maintain relationships across disciplines and across jurisdictions, 2) the ability to work within and use standardized incident command structure processes and manage mutual aid resources, and 3) the ability to construct accurate situational awareness. It is noteworthy that these three skills were so prevalent among the responses to the open-ended interview questions. The questions focused on identifying the reasons that made EMS disaster response successful. It is significant that all three of these skills were common among nearly all of the experienced professionals interviewed in this study. The specific terms used by respondents varied, but the concepts were nearly universal among the respondents.

Relationships in the context of this study equates to having knowledge and familiarity with individuals of other disciplines and other jurisdictions and their operational practices. Beyond just knowledge and familiarity, trust is an important element of relationships. Overcoming some of the challenges in responding to a disaster involves knowing the roles of other responding agencies and having trust in their abilities to perform their duties.

Responders at the sky bridge collapse in Kansas City knew each other before the event.

> …knowing the people that were there is what made it [*the response*] so significant…the individuals in charge of the plan knew each other...We knew each other; we personally knew each other. It made things go better, everybody did their own job as good as they could. We helped each other. It was knowing them, trusting them, and respecting them that made a difference…If you come to a disaster and meet them there for the first time, you know there are too many unknowns. (L. Cox, personal communication, May 21, 2010)

Prior to the 2007 wildfires in San Diego community partners and EMS stakeholders had built relationships.

> The fact that we had built such good relationships with our community partners and stakeholders contributed greatly to our success. The partnerships that were developed before the emergency, during the planning were critical. (M. Metz, personal communication, June 23, 2010)

A similar story was told about the response to the terrorist attack of the Pentagon.

> Working together is the key to success…This experience in working on a regional basis in the past has been a valuable lesson. All of those relationships that we built from 1995 to 2001 showed up that day on September 11. We were operating on the grounds at the Pentagon with the very few faces that we did not know. This cooperative effort allowed us to have the resources in both equipment and personnel to be effective that particular day…Quite frankly without those collaborative relationships we built ahead of time there may have been additional loss of life. We would not have been as efficient—we would not have had the resources as quick as we did to apply to it. (J. White, personal communication, June 17, 2010)

Performing EMS disaster response duties in Santa Barbara were facilitated by previous relationships.

> Relationships that you have established in advance, ahead of time are really valuable. Even though ICS is positions and functions, not individuals, it is the persons in those roles that make it happen. So, in calling hospital administrators they expect a call from me personally, they know me. A lot of it is personal trust—it comes down to that. (N. Lapolla, personal communication, June 2, 2010)

One unifying theme was that success was achieved because responders, including mutual aid responders, personally knew each other. There was a high level of trust in each other's ability to perform their duties. Trusting relationships were established in advance, and the familiarization, confidence, and mutual respect in competency to get the job done was a primary factor in successfully collaborating. As the EMS mission requires performance of the job through numerous agencies, trust[3] appears to be an important element of the EMS response to a disaster.

3. Incident Command System (ICS)/National Incident Management System (NIMS)/Mutual Aid

All disasters are local, e.g., city, county, or tribal. Wherever a disaster occurs, the local government organizations are the first to respond and react to address the needs of its people. Mutual aid from surrounding areas and the state government may be requested or offered. Given the magnitude of the event, assistance from the federal government can be requested. In a catastrophic event, federal agencies are moving towards a model where resources are pushed to the local level without request from the incident commander (The White House, 2006, p. 18; U.S. Homeland Security Department, 2008).

> Ultimately, when a catastrophic incident occurs, regardless of whether the catastrophe has been warned or is a surprise event, the Federal government should not rely on the traditional layered approach and instead should proactively provide, or 'push,' its capabilities and assistance directly to those in need. (The White House, 2006, p. 19)

The assistance that the federal government can bring to bear during a catastrophic event will likely improve the situation. In a catastrophe, local government and perhaps states will not have the resources needed to respond adequately. The *National Response Framework* and *Emergency Support Function Annexes* provide a sound plan for coordinating federal resources into the response effort. However, having a state and federal response greatly increases the complexity of the event.

[3] Having a prior relationship based on trust and confidence in each other to perform respective duties appeared to be the best circumstance. However, confidence in another was not essential. Knowing the capabilities of another, even if those capabilities were subpar, allowed others to compensate for the known shortcomings. Having the prior relationship is enough; dealing with unknown capabilities is the least desirable circumstance. (A. Elliott, personal communication, August 2010).

Disastrous events are fraught with unknowns. The circumstances during a disaster are anticipated to be anywhere from complex, to chaotic, to utter disorder (Bellavita, 2006, p. 4). Disorder occurs when agencies responding to a disaster are unable to put the event into a known context and cannot reach agreement on a course of action (Bellavita, 2006, p. 6). Yet, myriad responding agencies must learn to adapt rapidly to the circumstances to face the challenges appropriately (Bellavita, 2006, p. 17).

Terrorist attacks present unique problems and circumstances for EMS responders. The attack itself invokes fear yet the responders must continue to perform duties in this emotional state (Paton & Violanti, p. 231). Moreover, a terrorist attack may reduce or eliminate system resources, impede the ability to perform essential functions, and create an enormous surge in the number of sick or injured patients. During the TOPOFF 2 disaster exercise in 2003, it was found that the unanticipated large call volume was the greatest problem for hospitals in the Illinois venue (U.S. Homeland Security Department, 2003, p. 6). Further, the hospitals in this exercise ran short on supplies and staffing (U.S. Homeland Security Department, 2003, p. 7). The emerging and unpredictable nature of a disaster event requires a higher level of critical decision making that is more demanding than day-to-day response activities to routine matters (Paton & Violanti, p. 237). Adapting existing plans to the circumstances requires creativity, and EMS personnel will be working in a multi-agency/multi-jurisdiction environment, which adds to the complexity.

The Incident Command System (ICS) and the National Incident Management System (NIMS) are organizational tools used to manage the difficulty and chaos of a disaster and the complexity of managing mutual aid resources. Having the ability to work within ICS/NIMS structure and understand the terminology, philosophy, and processes is an essential skill.

A standardized command structure process helps to focus response efforts on established unified goals, thereby reducing some of the complexity. The unified command structure used at the Virginia Tech shootings incident worked well.

> The groups acted as one; they didn't look at the color of the uniform they looked at the objective. I think that in anything we do, especially if it is emergency services related, when we focus on the objective we accomplish the goal. When we focus on ourselves, we are going to miss the mark…As much as people fight the ICS training and NIMS, we had a command system set up that functioned well. We came together as a unified group. That is what brought things to an acceptable conclusion. (N. Turner, personal communication, June 18, 2010)

The ICS/NIMS approach also provided a framework to manage a vast number of mutual aid responders to the Pentagon attack.

> The most important tools were, this may sound funny, but relationships and a general understanding by everybody of what the mission was. We were all working towards the same goal…we were all one. (J. White, personal communication, June 17, 2010)

An ICS/NIMS structure was used for the Highway 101/Soledad tour bus accident, and experiences of the effectiveness were similar.

> It actually worked, it really did. In fact, the planning section chief in the incident was a retired fire chief, and we had worked quite closely; we worked hand in glove functionally for that incident. (T. Lynch, personal communication, Monterey County, May 27, 2010)

EMS Chief Marcy Metz offered other comments on command. “Education and training in ICS…having the basic fundamentals and knowledge and experience of incident command and all that training that we complain about really did pay off” (M. Metz, personal communication, June 23, 2010). Ventura County Public Health Director, and then EMS Administrator Barry Fisher, commented on the La Conchita landslide, “a unified command was set up pretty quick which was the key to smooth operation of the incident” (B. Fisher, personal communication, May 11, 2010). In looking back on the Alaska Airline crash off the coast of California, Julie Frey offered comments for improving future response efforts, “mandatory training of ICS for all county Department managers” (J. Frey, personal communication, June 3, 2010). During the Jesusita Fire in Santa Barbara, Nancy Lapolla knew that she did not have enough staff people to provide all of the core EMS roles that needed to be performed. She was reliant on mutual aid from outside the department to help her meet the EMS Department’s obligations. Using

the ICS/NIMS organizational framework she was able to manage the responsibilities. “I knew that we did not have enough depth to cover all of the duties, so using other resource was just invaluable” (N. Lapolla, personal communication, June 2, 2010).

4. Situational Awareness

A crucial need in a complex, emerging, and chaotic situation is the ability to recognize signs from the chaos and build an accurate situational awareness of the event; doing so facilitates appropriate decision making (Paton & Violanti, p. 231). Developing competence at building accurate situational awareness greatly improves the ability to perform the essential, core EMS disaster response roles. Having keen situational awareness skills facilitates forecasting and anticipating needs (Paton & Violanti, p. 231).

Situational awareness “…is knowing what is going on around you” (M. R. Endsley, p. 5). Having a solid grasp of the EMS needs produced by a disaster along with an understanding of the resources available is a practical definition of situational awareness. The challenge is often that little information is available to form a clear understanding of the situation. Alternatively, the challenge might be that there is a lot of information and one must select the right cues from a pile of data to form an accurate assessment of the situation.

The importance of situational awareness was described by responses to the open-ended interview questions.

> You have to be able to assess a situation quickly, make a decision quickly, and hopefully you've made the right decision based on the minimal information available to you, and within your ability to be able to process that information. I think that truly is a skill in itself, as well.” (T. Lynch, personal communication, San Luis Obispo County, May 27, 2010)

Metz from San Diego said,

> I relied heavily on the people here at the MOC for situational awareness and planning…To have this detailed information readily available was important and useful. It helped with our situational awareness. (M. Metz, personal communication, June 23, 2010)

Dan Burch stated,

> By understanding the broader issues we brought rational decision-making to the event. It was important that EMS was not just a rubber stamp to the incident commander in the field. Our ability to critically think about this evolving incident improved the conditions of the evacuation. (Burch, 2010)

Another example of the importance of situational awareness is provided from Los Angeles,

> Having fire chiefs' cell phone numbers allowed me to contact them in the field at the incident and get situational information…I was watching on television and to find out what the media was saying so that we could all be on the same page regarding the actual situation. (C. Chidester, personal communication, May 27, 2010)

Endsley describes situation awareness in four levels: perception, comprehension, projection, and temporal aspect. Level 1-Perception is the ability to detect relevant elements or cues from a chaotic environment. Level 2-Comprehension is the ability to understand the meaning and interpret the elements or cues. Level 3-Projection is the highest ability of situational awareness; it is the ability to forecast future events or needs based on the current situation. Level 4-Temporal Aspect is the ability to understand the importance of time in the context of the situation and employing the right timing to meet the needs (Endsley, pp. 5–7).

An example of the usefulness and practical application of situational awareness comes from Monterey County.

> I was driving back from San Jose when I got the call…In assessing the situation from my vantage point we had 35+ critical injuries. I knew we were going to be completely out of our system resources; both in terms of vehicles and people. But, more importantly the psychological stress these people were going to be under means that these crews are going to need to go out of service after the incident. A [*ambulance*] strike team would be needed for system coverage and to conduct secondary transfers for patients from the receiving hospitals to trauma centers. (T. Lynch, personal communication, Monterey County, May 27, 2010)

In this example, the EMS official was able to use the current situation information to anticipate the EMS system's future needs and begin planning for those needs.

In the context of emergency response to a disaster, situational awareness skills allow responders to function adequately with few cues in a stressful, complex, and dynamic environment. A person with high situational awareness skills "…can construct mental models of complex events that allows appropriate decisions to be made…" (Paton & Violanti, p. 237). Further, it has been demonstrated that situational awareness is the main precursor to decision making (Endsley, p. 8). EMS responders and other disaster workers must make appropriate decisions to implement a successful response and recovery effort. More specifically, high situational awareness "…minimizes exposure to risks, allows more efficient use of resources, and enables better command and control…" (Paton & Violanti, p. 231).

Of course, possessing strong situational awareness skills does not ultimately guarantee good outcomes. The actions taken based on the situation must still be the right decision. A responder may have an excellent assessment of the existing situation, yet make a wrong strategic or tactical decision (M. R. Endsley, p. 8). However, the chances for successful outcomes do increase if the decisions are based on an accurate assessment of the situation (M. R. Endsley, p. 27).

D. TOOLS AND EQUIPMENT

As discussed previously, one segment of the research question explored in this thesis is to identify the *skills* a LEMSA needs to fulfill its role successfully during a disaster. Another segment of the research question is to determine the *tools* a LEMSA needs for disaster response. Open-ended interview questions were used to identify specific tools and equipment most useful for past events.

Six specific tools and equipment were identified as being the most important in successfully performing core EMS disaster response roles. They are listed in order of importance. Importance was determined quantitatively from the interview data in the same manner used in tabulating skills. All tool items were then tallied for all interviews.

The results are expressed in percentages; that is, the percent of events in which a specific tool or piece of equipment was used in EMS' disaster response role. The results revealed the six most important tools and equipment.

1. Cell phone
2. Two-way radio
3. Computer, along with various Internet applications[4]
4. Telephone[5]
5. Call Lists
6. Geographic Information System

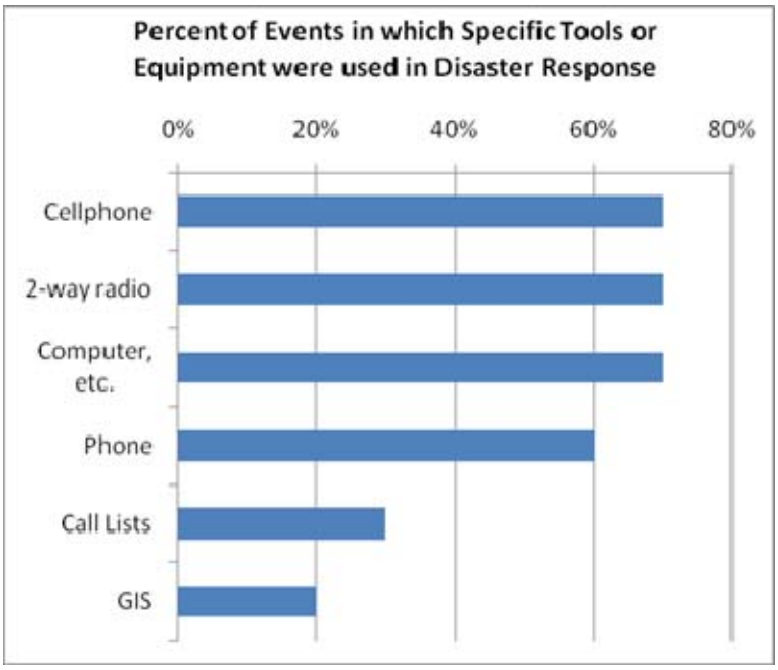

Figure 6–1. Specific Tools

[4] Interview respondents did not make a distinction between a computer and the software application used to perform their duties. Several specific programs were mentioned, such as Internet, ReddiNet, WebEOC, Reverse 911, California Health Alert Network (CAHAN), and e-mail. Yet, in the context of the responses, the application cannot be used without a computer and associated networks and infrastructure. Therefore, all computer-related responses were combined into the category of "computer, along with various Internet applications."

[5] Cell phones and telephones were not grouped together. Interview respondents made the distinction between the two modes of communication. The technologies and infrastructure between the two modes vary. Consequently, the researcher did not alter the wisdom of the responses by grouping cell phones and telephones as one tool.

Several other tools and equipment were identified in the interviews. However, only one person mentioned all of the other items. These items were pager, bullhorn, clipboard, television, paper maps, nurse go-kits, a Regional Disaster Medical Health Coordinator, and a fax machine. The lack of commonality for each of the individual items makes it difficult to conclude that these other items can be widely applicable in a broader context.

It is interesting to note that all of the six tools and equipment identified as essential in performing core roles serve to facilitate communications and provide the means to gather situation information. Cell phones, two-way radios, and standard telephones provide the means to talk with others. Through such conversations, information can be gathered, distributed, and exchanged. The conversations can be used to gather cues about the situation.

A computer, along with various software applications and Internet access, provide a host of other opportunities for communicating. Specific applications were mentioned during the interviews as being useful.

> We have a pre-hospital computer system, which is similar to ReddiNet; we asked all hospitals to update their information, and to find out: who could take how many patients, who is down, and find out what needs they may have. To have this detailed information readily available was important and useful. (M. Metz, personal communication, June 23, 2010)

In Los Angeles, a similar software tool that provides direct communication between hospitals and LEMSAs was identified. “ReddiNet was the most useful; that was instrumental in doing this—this gives hospital information on where patients are being taken” (C. Chidester, personal communication, May 27, 2010).

During the San Simeon Earthquake, one of the EMS officials happened to be in Denver, Colorado. Upon learning of the disaster, the official assisted in performing some of the core EMS disaster response functions from a hotel room.

> Being able to communicate through e-mail was essential. It is an amazing technology that allows me, from 1,200 miles away, to be support to an ongoing incident. By using the telephone, laptop, and Internet based hospital status system I was able to assist EMS even though I was one third of the country away. (T. Lynch, personal communication, San Luis County, May 27, 2010)

It appears that computers and associated applications, including the Internet and e-mail, can be important tools in gathering and sharing information.

Call lists in the context of this study are pre-prepared lists of contact people and organizations that may be needed in the disaster response, along with phone numbers or other vital contact information. Call lists can be in a variety of forms: lists on paper, a computer file, memory space within a cell phone, and so on. For the evacuation of a skilled nursing facility, Burch indicated, "I used a phone list. The phone list was the most useful resource I had available to me. Having all of the phone numbers that I needed readily available improved my efficiency" (Burch, 2010). San Diego uses the call list approach, but it is in the form of robust technology for reaching a great number of people. "We implemented our reverse 911, and 'Alert San Diego' which is our automated telephone delivery system" (M. Metz, personal communication, June 23, 2010). In addition, Metz also maintained a list for hospital contacts, "we have the hospital emergency planners on one distribution list" (M. Metz, personal communication, June 23, 2010).

Geographic information systems (GIS) are not widely used among the people interviewed for this study. However, the two jurisdictions that did use GIS found the technology to be useful. GIS assisted in providing information to build and enhance situational awareness. Lapolla from Santa Barbara said,

> The list of and numbers of organizations that coincide with the maps were available on GIS, so you can go and look electronically or on paper. The maps were critical—if the fire is coming we knew what we had to do. So we knew roughly how many ambulances and how many buses it would take to evacuate each facility in each zone. Since we had done our homework previous to the event all we needed to do was click on them and all of the information was there. And, it worked as we expected. (N. Lapolla, personal communication, June 2, 2010)

Metz in San Diego had a similar experience.

> One of the biggest things that aided us in performing our job was the GIS system; we were following the location of the fire and tracking its advance. From this information the MOC could predict who was at risk and alert those facilities to be prepared to evacuate. (M. Metz, personal communication, June 23, 2010)

It is posited that GIS technology may be an important tool in the future for EMS disaster response and may likely be available more broadly.

E. DIVINE INTERVENTION

Two unexplainable occurrences were uncovered while conducting this research that are worth noting. Perhaps, the events might be aptly termed strokes of good luck. Maybe, the positive outcomes were the result of a mash-up of complex adaptive systems. A mash-up is the combining of two or more unrelated things that yields an unexplained power or energy (Ramo, 2009, pp. 126–129). For lack of a better phrase about these two unexplainable events, they are called divine intervention in this research.

While in his vehicle responding to the active shootings at the Virginia Tech campus, the EMS official started to identify in his mind the people and resources he might need as this disaster unfolds. He said,

> The names of folks that I have been associated with over my 33 years in this business flashed in my mind that morning; not only the 30+ names, but I could recall their telephone numbers! That does not normally happen. I believe that God gives us an extra sense when we need it; I needed it and I got it. (N. Turner, personal communication, June 18, 2010)

Twenty-six years earlier, in Kansas City, Missouri, a series of pedestrian bridges collapsed injuring hundreds. The disaster required the use of every ambulance in the city and within the surrounding region.

> Every ambulance in the region was deployed to the event. It was kind of amazing that from the time of the collapse until after midnight there was not one emergency call in Kansas City that entire evening; that was a

> miracle. There was not one request for an ambulance in the entire city of Kansas City. I don't know how to explain it. I can't tell you why; that is just the way it was. (L. Cox, personal communication, May 21, 2010)

Instant recall of names and phone numbers of several people; no emergency calls during an entire evening in a large city; these two events cannot be easily explained. Nor are these events likely to be replicable or predictable for future EMS disaster response efforts. Yet, the nature of these occurrences is curious. The positive outcomes are undeniable, and the events are worthy of mentioning in this research. If the cause of these events can be understood and captured, the ability to prepare for and respond to disasters may be improved.

F. SUMMARY

The findings from this research are significant. Existing literature does not identify the most important disaster response roles for EMS, nor does existing literature name the competencies, skills, and tools needed for achieving minimum levels of disaster preparedness. This research makes a strong effort to define these components. Ten common core EMS disaster response roles have been identified among a variety of disaster types from different parts of the nation. The underlying competencies or knowledge base it takes to execute the disaster roles successfully have been uncovered along with three essential skills. In addition, the tangible tools and equipment found most useful to perform the disaster response roles have been recognized and listed. With this knowledge, it may be possible to construct a realistic framework for achieving disaster preparedness within a local EMS agency. The framework for LEMSA disaster preparedness is described below.

Ten core EMS disaster response roles have the greatest likelihood of being used in a disaster. To achieve an adequate level of disaster preparedness, local EMS agencies should have the competency to perform these 10 functions, at a minimum.

1. Establishing effective, reliable interoperable communications between EMS, incident command, public health, and healthcare facilities
2. Activating the disaster medical and health system and notification of key positions; initiating recall to staff spare ambulances, and provide immediate surge capability
3. Assessing the need for additional medical resources (mutual aid)
4. Possessing the ability to acquire, allocate, mobilize, and support additional resources (mutual aid)
5. Being able to develop awareness of the situation and passing that information to others in the command chain
6. Activating medical surge plans, procedures, and protocols
7. Managing pre-hospital patient distribution and tracking
8. Tracking use and assignments of personnel, equipment, and other non-disposable medical resources
9. Transforming the pre-hospital system to disaster status
10. Maintaining an EMS resource inventory for the system

Local EMS agencies should possess two essential underlying competencies or knowledge bases to achieve an adequate level of disaster preparedness.

- Experience—gain experience through participation in actual disaster response situations and/or gain experience by participating in a sufficient number of drills and exercises to have confidence in the ability to perform the 10 core EMS disaster response roles.
- Preplanning–prepare mass-casualty disaster response plans based on the likeliest threats to the jurisdiction; continually update and improve disaster response plans based on lessons learned from debriefings of new multi-casualty incidents or drills.

Local EMS agencies must acquire and develop three specific skills to achieve an adequate level of disaster preparedness.

1. Ability to build and maintain relationships across disciplines and across jurisdictions
2. Ability to work within and use standardized incident command structure processes and manage mutual aid resources
3. Ability to construct accurate situational awareness

Local EMS agencies should have available and ready six specific tools or pieces of equipment to achieve an adequate level of disaster preparedness.

1. Cell phone
2. Two-Way radio
3. Computer, along with various Internet applications
4. Telephone
5. Call Lists
6. Geographic Information System

This framework might be a basis in which to define and envision the parameters by which a local EMS agency can achieve an adequate level of disaster preparedness. In other words, this framework may be what EMS disaster preparedness looks like. Of course, this framework is only a starting point, a minimum level of adequacy. Building competencies and skills beyond those identified in this framework, and acquiring a broader range of tools and equipment are likely to expand a LEMSA's level of disaster preparedness.

If this framework does accurately represent an adequate level of disaster preparedness, then how can the competencies and skills be measured? How do agency staffers, agency managers, EMS system stakeholders, elected officials, and members of the community know if an adequate level of disaster preparedness has been achieved? The next chapter examines ways to measure preparedness.

VII. IMPLEMENTATION

A. INTRODUCTION

The findings reached in Chapter VI illustrate what disaster preparedness means for a local EMS agency. Uncovering this information is important and useful, but this is not the final step. Discussion is needed on how a LEMSA might achieve an adequate level of disaster preparedness.

Using the findings from the previous chapter, it is possible to construct a basic framework for LEMSA disaster preparedness. Table 7-1 shows the framework. Elements of the framework include ten core EMS disaster response roles; two essential competencies or knowledge bases; three skills needed to perform the core roles; and six tools or equipment most useful in performing core roles. Together, the components of the framework embody or define minimum standards for adequate disaster preparedness.

Although there is value in understanding the ten core EMS disaster response roles, knowing how to perform those roles successfully is also valuable. Items to consider when assessing performance capabilities are offered for each role. Performing the roles is contingent upon having the experience, knowledge, and skills to do so. Training strategies for building competencies, knowledge, and skills follows.

Ten Core EMS Disaster Response Roles	
1.	Establishing effective, reliable interoperable communications between EMS, incident command, public health, and healthcare facilities
2.	Activating the disaster medical and health system and notification of key positions; initiating recall to staff spare ambulances, and provide immediate surge capability
3.	Assessing the need for additional medical resources (mutual aid)
4.	The ability to acquire, allocate, mobilize, and support additional resources (mutual aid)
5.	Being able to develop awareness of the situation and passing that information to others in the command chain
6.	Activating medical surge plans, procedures, and protocols
7.	Managing pre-hospital patient distribution and tracking
8.	Tracking use and assignments of personnel, equipment, and other non-disposable medical resources
9.	Transforming the pre-hospital system to disaster status
10.	Maintaining an EMS resource inventory for the system

Ten Core EMS Disaster Response Roles
Two Essential Competencies or Knowledge Bases • Experience –actual disaster response and/or drills and exercises • Preplanning –mass-casualty disaster response plans of likeliest threats; applying lessons learned to plans on ongoing basis
Three Skills Needed to Perform Core Roles • Ability to build and maintain relationships across disciplines and across jurisdictions • Ability to work within and use standardized incident command structure processes and manage mutual aid resources • Ability to construct accurate situational awareness
Six Tools or Equipment Most Useful in Performing Core Roles 1. Cell phone 2. Two-way radio 3. Computer, along with various Internet applications 4. Telephone 5. Call Lists 6. Geographic Information System

Table 7–1. Framework for LEMSA Disaster Preparedness

B. TRAINING STRATEGIES FOR BUILDING ESSENTIAL COMPETENCIES, KNOWLEDGE AND SKILLS

The framework for LEMSA disaster preparedness identifies five key components, termed competencies, knowledge and skills essential for achieving an adequate level of disaster preparedness.

- Two essential underlying competencies or knowledge bases
  - Experience –actual disaster response and/or drills and exercises
  - Preplanning –mass-casualty disaster response plans of likeliest threats; applying lessons learned to plans on ongoing basis
- Three specific skills needed to perform core roles
  - Ability to build and maintain relationships across disciplines and across jurisdictions
  - Ability to work within and use standardized incident command structure processes and manage mutual aid resources
  - Ability to construct accurate situational awareness

This section discusses strategies for developing skills and improving competencies. Some skill development may occur through training, which may be used to develop competency in ICS/NIMS, managing mutual aid resources, and enhancing

situational awareness capabilities. Training may provide opportunities for building disaster response experience, and the training setting may provide opportunities for building relationships. Training may also provide opportunities for improving existing plans, if lessons from the trainings are documented and used to update plans continually. Methods and strategies for building essential competencies/knowledge and developing skills must be understood before the five key components can be measured. Gaining understanding in how skills and competencies are fostered provides a basis for measuring those skills and competencies.

Traditional approaches to disaster preparedness training are often geared towards those job classifications that generally respond to the front line, such as paramedics, emergency medical technicians, and fire fighters. Training and familiarization with the Incident Command System (ICS) and National Incident Management System (NIMS) is essential. Federal homeland security funding includes a mandate that states and local governments become proficient at ICS and NIMS, making such training prevalent in many venues. A multi-agency or multi-jurisdictional drill may occur once every three to five years, if grant monies become available for a large functional exercise. However, generally drills consist of one or two similar agencies, such as two fire stations in one fire department, or two sections within one hospital. Drills and exercises often come with an expectation that all participants will achieve proficiency at the end of the session. This leaves the responder (student) with an understanding that if the skill can be performed proficiently, then outcomes will be positive. Establishing unrealistic outcome expectations can have negative psychological impacts on emergency responders (Paton, 1994). Traditional approaches to disaster preparedness training often focus on learning or improving a skill or two. Examples include conducting a bed capacity census with several hospitals in a region, speaking on a two-way radio, or performing triage on mock patients.

Improving preparedness involves changing the focus of training. It is not proposed that all past training techniques be abandoned. Rather, certain components of training must be altered and a few new elements added to obtain a better level of preparedness.

The *Eliminate-Reduce-Raise-Create Grid* (Kim & Mauborgne, p. 35) shown in Table 7-2 provides a brief glimpse of the proposed training strategy to improve disaster preparedness. Some aspects or approaches of traditional training programs need to be reduced or eliminated all together, while other approaches need to be raised or created. The proposal shown in Table 7-2 is further expanded using the strategy canvas.

Eliminate: Drills & exercises with predictable & perfect outcomes; Exclusion of non-traditional responders from drills/exercises	**Raise:** Awareness of realistic outcomes; Awareness of psychological impacts/reactions; Number of experiential training opportunities; Number of multi-disciplinary drills
Reduce: Single-agency disaster drills and exercises; Training that focuses solely on ICS/NIMS	**Create:** Collaborative projects; Multi-jurisdictional disaster drills; Family support infrastructure; Frequent situations that force staff to deal with the unexpected

Table 7–2. EMS Disaster Preparedness Training (Eliminate-Reduce-Raise-Create Grid (From: Kim & Mauborgne, 2005)

The strategy canvas shown in Figure 7-1 illustrates the changes being proposed compared to traditional training approaches (Kim & Mauborgne, 2005, p. 25). The *Existing Strategies* line depicts the traditional training strategies for preparedness. Training is conducted primarily for first-responder personnel; disaster training of support personnel is not traditionally emphasized. Consequently, the category labeled *Exclusion of Non-traditional Responders from Drills/Exercises* is rated high for the traditional approach because clerical and office staff members are often excluded from such events. The *New Strategies* line is rated low for *Exclusion of Non-traditional Responders from Drills/Exercises* to depict just the opposite of the traditional approach: inclusion of non-traditional responders needs to be a high priority.

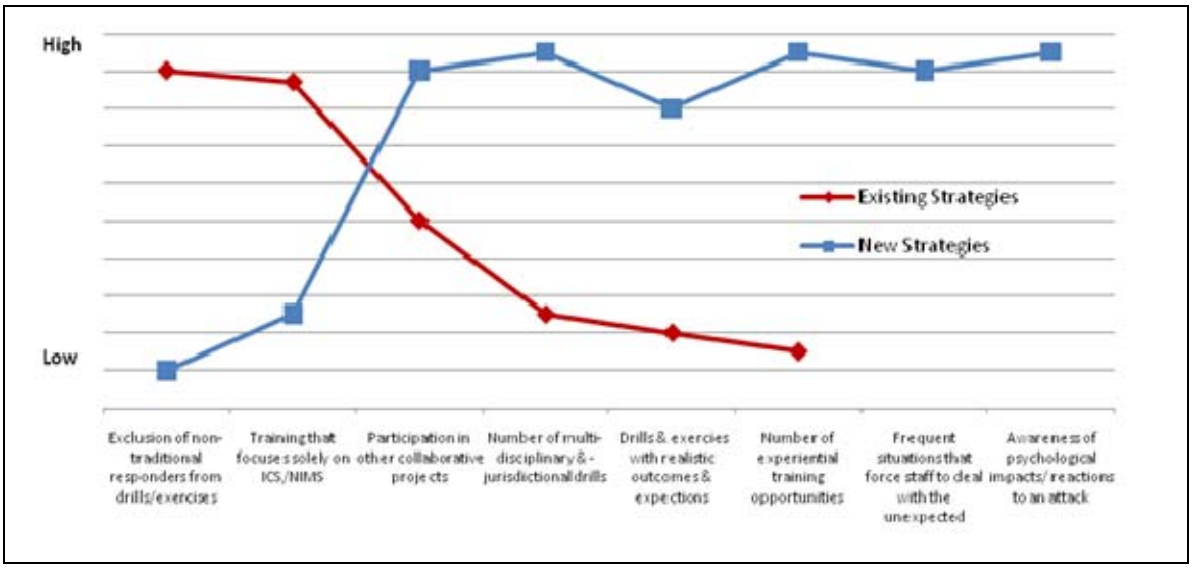

Figure 7–1. Training Strategies for Building Competencies, Knowledge and Skills

Eight training strategies are listed in the strategy canvas along the horizontal axis. The concept behind each of these training strategies is explained below. Achieving an improved level of disaster preparedness in EMS involves strategically changing training approaches. Incorporating these strategies into a LEMSA's training program will help to build the competencies, knowledge, and skills needed to respond to disasters.

1. Expose All Levels of Staff and Volunteers to Experiential Training

Non-traditional responders should be included in disaster exercises and drills. It is appropriate to include paramedics, nurses, and other clinical people in disaster drills, but there are myriad others that provide support and vital functions beyond those with a medical training. Other job classifications include administrative assistants, account clerks, technical support, and other office service positions. Each of these people can perform critical jobs during a disaster, but they need to be part of and receive the training that other responders receive.

Organizations that distribute power and decision-making authority throughout and to the lowest levels of the structure are often the most effective. As Joshua Cooper Ramo states, "when you spread power instead of hoarding it, you discover benefits that you couldn't have imagined in advance—and that sometimes run contrary to what you might

have expected" (Ramo, p. 236). In addition to improving efficiencies and possibly creating synergy, empowering, devolving, and delegating responsibility for decision making through an organization can have positive stress outcomes; more self-control can reduce incidences of post-traumatic stress disorder (Paton & Violanti, p. 229). Consequently, experiential training to boost situational awareness competencies should not be limited to top ranking people within an EMS organization.

2. Leverage ICS/NIMS Training Opportunities to Build Relationships

ICS and NIMS training is pervasive because of the federal mandate tied to grant funding. It is important to provide this training to satisfy the mandate and contractual obligations. However, beyond the mandate, as determined through this research, ICS and NIMS training is a key element in being successful in responding to disasters. Much of the basic ICS/NIMS training can be done individually online. The online courses provide a conceptual overview and generic concepts of operation. However, the more advanced courses, such as ICS 300 and ICS 400, or equivalent, require training in a classroom setting and require working in groups to solve problems. The advanced courses require application of the ICS/NIMS concepts and provide the opportunity to practice working in the structure and using the processes.

Disaster preparedness training should not stop with ICS/NIMS; often it does. Agencies spend a great deal of effort acquiring proficiency at various ICS levels, which can be positive. However, using these training opportunities as venues to interact with other emergency response disciplines and other jurisdictions can enhance the long-term benefit of the training. Where possible, ICS/NIMS training sessions should be offered to organizations likely to be co-first responders to a local disaster and to those organizations in the region likely to provide mutual aid.

3. Provide Trust-Building Opportunities at Multi-Disciplinary and Multi-Jurisdiction Levels

Research conducted by Daniel J. McAllister of Georgetown University indicates a link exists between trust and interpersonal behavior (McAllister, 1995, p. 51). In simple

terms, he found that people who have experience working together, and have demonstrated through actions that they are competent and keep their word, build trust. Further, affect-based trust between individuals can improve work performance (McAllister, 1995, p. 53). There may be tangible disaster response performance benefits if individuals from different organizations have the opportunity to work, drill, and exercise together. Moreover, the more individuals in an organization are trusted, the more likely the organization to which those individuals belong is trusted (Zaheer, McEvily, & Perrone, 1998, p. 153). According to Zaheer et al., there is "… a direct link between inter-organizational trust and performance" (Zaheer, McEvily, & Perrone, 1998, p. 154). It can be concluded that agencies likely to respond together in a disaster setting can build trust and improve performance by routinely holding joint drills and exercises.

4. Build Familiarization of Individual Responders Through Collaborative Projects

Working together on drills and exercises is not the only venue that might build trust. Working together on other community projects, i.e., fundraisers, social committee, special projects, and professional organizations provide the opportunity to build interpersonal relationships. The effort that individuals make to work on and assist others on a common project provides a level of social support, which translates into trust; *making the effort to help is nearly as valuable as the help itself* (McAllister, 1995, p. 53), in regards to building trust between individuals. Moreover, informal relationships are vital to the work performed by organizations (McAllister, 1995, p. 55).

Research conducted by Harvard and MIT suggests that repeated contact in a social setting increases trust among individuals (Glaeser, Laibson, Scheinkman, & Soutter, 2000, p. 814). Again, this points to the opportunity for building trust among individuals by conducting multi-agency and multi-disciplinary, and multi-jurisdictional drills and exercises. Having social connections, such as in exercise planning meetings and steering committees, is a strong predictor of trustworthiness (Glaeser, Laibson, Scheinkman, & Soutter, 2000, p. 840).

5. Ensure Training Opportunities Include Rare and Unexpected Elements to Build Schemata and Enhance Resilience

Several possible negative psychological impacts exist that may affect an EMS responder from functioning at peak performance during a disaster. However, humans are resilient creatures, and not all emergency responders are equally affected or affected in the same manner. Good can and does come from surviving a disaster. As described by Richard Gist,

> Resilience is a complex set of interactions that allows people not to avoid the discomforts of adversity and challenge but to manage their ways through them, often to discover enhanced strength as a consequence. (Gist, p. 429)

The negative impacts might be mitigated and the opportunity for resilience enhanced if organizations worked towards improving training and exercises that better prepare emergency responders for the complexity, ugliness, and reality of the aftermath of a disaster (Paton, p. 283).

Resilience might also be fostered by expecting the unexpected. One of the disaster preparation strategies proposed by Brandon & Silke calls for incorporating the unexpected into normal situations as much as possible. They contend that by learning to work with the unexpected, people will react less vigorously to a one-time terrorist attack (Brandon & Silke, p. 187).

Resilience following a disaster can be manifested in improved relationships. Survivors can become closer and more appreciative of their family and friends (Committee on Responding to the Psychological Consequences of Terrorism, p. 131). People turn to one another during and after disasters for social support. Beyond the initial need to reach out to family and friends to determine their status, people seek familiar groups for reassurance and support. Recognizing that people are resilient provides the opportunity to build on that strength and may serve to improve the recovery effort (Brandon & Silke, p. 187).

6. Develop Experiential Training Opportunities to Enhance Situational Awareness Skills

> People reconcile their experiences to construct integrated conceptual frameworks (schemata) to provide a basis for making sense of new experiences, anticipating future demands, and planning appropriate courses of action to deal with them. (Paton, p. 276)

In other words, past experiences are used as a basis for decision making and taking future actions. As Paton (p. 276) further describes, people understand and react to an event based on what is known from their own lives. When a person is faced with a traumatic or stressful event, the individual's training and experience is relied upon to make good decisions and take appropriate actions. The schema provides a viable framework for an EMS responder to make sense of the event and develop appropriate action plans (Paton, p. 276).

If the schema theory is true, then education for EMS responders can be designed to provide appropriate experiential training. Training designed to prepare individuals for the atypical demands they are likely to encounter can provide them with the knowledge, skills, roles, and attitudes appropriate for dealing with unknown situations (Paton, p. 276). Having a dialogue on unexpected scenarios may help build a more familiar context for EMS responders, which may lessen anxiety and increase response capacity (Brandon & Silke, p. 187). Organizations that facilitate the capacity to place an event into a known context and give it meaning, such as in an experiential training program that may help EMS responders to understand a disastrous event and reduce the chance that responders will be overwhelmed (Paton & Violanti, p. 232).

7. Establish Realistic Expectations of Success

The point of adjusting EMS education programs to include atypical and unexpected scenarios is to increase adaptive capacity. The broader the range of experience, the more familiar people become at recognizing cues that help build an accurate situation assessment. Moreover, such training may improve an EMS responder's ability to adapt to the complex and unusual circumstances faced. Training that

incorporates 1) realistic outcome expectations, not sugarcoated perfect outcomes (Paton, p. 283), 2) an ability to differentiate personal and situational constraints, and 3) interpretive processes that review experiences as learning opportunities that enhance future competence provides the opportunity to increase adaptive capacity and ultimately improve performance (Paton & Violanti, p. 235).

8. Introduce Psychological Impacts of a Terrorist Attack and How Perceptions May be Altered

Situational awareness is one of the key skills for achieving preparedness. The impacts of a terrorist attack and perhaps other disasters may skew perceptions and distort the actual situation in the EMS responder's mind. It is important to recognize this phenomenon and ensure responders are aware of the implications. Understanding how the mind might respond to an overwhelming and frightening event may improve the ability to build accurate situation awareness.

The intent of terror is to instill fear and inflict psychological pain on a society (Committee on Responding to the Psychological Consequences of Terrorism, p. 99). Acts of terrorism serve to disrupt the sense of safety in a community and fear destabilizes confidence in the surroundings (Paton & Violanti, p. 228). Fear not only strikes the public at large, but those people expected to perform EMS roles may also be fearful. Yet, Zimbardo states, "…the human mind is so marvelous that it can adapt to virtually any known environmental circumstance in order to survive, to create, and to destroy, as necessary" (Zimbardo, p. 26). Providing information about normal psychological reactions and normal fear resulting from a terrorist attack provides an appropriate contextual framework for EMS responders and other homeland security personnel to help understand the emerging situation (Committee on Responding to the Psychological Consequences of Terrorism, p. 109). It is this adaptable human mind and spirit coupled with essential preparedness skills that may improve the local EMS agency's ability to respond during a disaster.

Stressful events, such as a terrorist attack, can create long-term psychological impacts if the event "shatters a person's view of the world" (Brandon & Silke, p. 182).

Without experience or training that provides a substitute for experience, it can be difficult for emergency responders to make sense of the events. Without a context to understand the event, stress is increased and coping mechanisms may not be adequate. Fear and stress may deplete an EMS responder's physical ability to perform the job adequately (Brandon & Silke, p. 177). Beyond physical depletion, stress may affect cognitive and creative abilities; performance in creating solutions to complex, emergent problems may be adversely affected (Paton & Violanti, p. 225).

Decisions made by emergency responders during a response to a catastrophic event may be based on an inaccurate situational awareness. People strive to alter the meanings of the attack to reduce the negative impacts. This altered view occurs without an understanding that the person's view is not reflective of the actual situation (Brandon & Silke, p. 186). The tendency for people to be more optimistic than may be warranted given the actual situation can affect their decision-making ability. The skill of interpreting pieces of information, determining the most relevant pieces, and putting it all together to create accurate situation awareness can be hampered if emergency responders are not aware of the psychological impacts of a terrorist attack.

Implementation of the eight training strategies listed above may ultimately improve disaster response capabilities. Some of the literature on disaster preparedness theorizes that procedures used during a disaster response should be incorporated into daily, routine activities. Falkenrath refers to the concept as *dual-use* activities (Falkenrath, 2000, p. 25). Nelson et al. terms the concept *crosscutting capabilities* (Nelson, Lurie, & Wasserman, Assessing Public Health Emergency Prepardness, 2007, p. 13). Both concepts are essentially the same. They conclude that the only practical method of remaining prepared for disasters is to integrate disaster functions into daily duties (Nelson, Lurie, Wasserman, Zakowski, & Leuschner, 2008, p. 9).

Given the metamorphosis that EMS systems must undergo to address disasters, it may not be practical to incorporate disaster response functions into daily routines. The concepts of operation are opposites. However, it may be more feasible to incorporate the eight training strategies into daily routines. Doing so develops skills important for disaster responses, and the procedures do not conflict with daily procedures.

C. MEASURING PERFORMANCE CAPABILITY OF THE TEN CORE EMS DISASTER RESPONSE ROLES

Using the framework shown in Table 7-1 as a basis to define the parameters by which a local EMS agency can achieve an adequate level of disaster preparedness, the next step is to address methods for measuring the parameters. The 10 core EMS disaster response roles represent actions expected to be taken in response to a disaster.

Some of the literature indicates that the absence of clear metrics to evaluate preparedness is problematic (Nelson, Lurie, & Wasserman, 2007, p. 10). Davis et al. indicates that disaster preparedness cannot be measured without first standardizing measurements of organizations and communities (Davis, Mariano, Pace, Cotton, & Steinberg, 2006, p. 68). A study from the University of Louisville determined that no single theory or set of theories exists for core concepts in disaster preparedness planning or practice (Covington & Simpson, 2006, p. 3).

The findings from Chapter VI may be a step towards solving some of the past problems. This research indicates that the 10 core EMS disaster response roles are common among many local EMS agencies. Perhaps this represents a single theory for core concepts in disaster preparedness planning. If so, developing a standardized measurement to evaluate preparedness may be possible.

It is suggested that each role be evaluated to determine if the capability exists in the jurisdiction by using the 10 core EMS disaster response roles as a basis for simple measurements. It will be incumbent upon each local EMS agency to determine if the jurisdiction does have the capability to perform each role, or not. Each agency must assess its capabilities and make a subjective judgment. Possible metrics are as follows.

1. Can the LEMSA establish effective, reliable interoperable communications between EMS, incident command, public health, and healthcare facilities? Yes or No.
2. Can the LEMSA activate the disaster medical and health system and notification of key positions; initiating recall to staff spare ambulances, and provide immediate surge capability? Yes or No.
3. Can the LEMSA assess the need for additional medical resources (mutual aid)? Yes or No.

4. Does the LEMSA have the ability to acquire, allocate, mobilize, and support additional resources (mutual aid)? Yes or No.
5. Does the LEMSA possess the skills to develop awareness of the situation and pass that information to others in the command chain? Yes or No.
6. Does the LEMSA have procedures and protocols in place for activating medical surge plans? Yes or No.
7. Can the LEMSA manage pre-hospital patient distribution and tracking? Yes or No.
8. Can the LEMSA track use and assignments of personnel, equipment, and other non-disposable medical resources? Yes or No.
9. Can the LEMSA transform the pre-hospital system to disaster status? Yes or No.
10. Does the LEMSA maintain an EMS resource inventory for the system? Yes or No.

The method or procedures for building the capabilities to perform each of these 10 roles may not be common. The procedures for taking the actions vary by jurisdiction and are dependent upon local needs and resources. However, for purposes of developing standardized measurements, it is only important to determine if the role can be performed. The method by which each jurisdiction achieves the capability is not necessarily relevant. Appendix C offers suggestions on factors that might be considered in evaluating a LEMSA's ability to perform each role. Items for consideration are not exhaustive, and many may not be applicable to every jurisdiction. Rather, these are provided from the author's limited and narrow perspective; these have not been vetted in any way or validated through research.

Additionally, in regards to evaluating the capability to perform each role, it is necessary to make a subjective judgment. Relying on the subjective opinions of managers, chiefs, and other high-ranking officials can be considered a weakness in the validity of the assessment results. It is unfortunate that reliance on subjective opinions is needed to measure preparedness. Yet, some believe that opinions from experienced practitioners are valuable and valid in building disaster preparedness metrics (Covington

& Simpson, 2006, p. 26). Self-reported data is not uncommon; it may be necessary to not only rely upon the opinions of experts, but also accept a certain amount of bias in the study of preparedness (Jackson, 2008, p. 22).

The literature indicates that it is impossible to have 100 percent accuracy with a disaster preparedness measurement model. However, the biggest problem is the failure to reach consensus on which metrics to use, not accuracy (Covington & Simpson, 2006, p. 27). Perhaps, using the 10 core EMS disaster response roles as metrics may move the EMS discipline closer to consensus and closer to a viable disaster preparedness measurement model.

D. MEASURING COMPETENCIES AND SKILLS

Several training strategies have been offered that support development of the five essential competencies, knowledge, and skills. However, how are these competencies, knowledge, and skills measured? It is not uncommon in an academic or professional training setting to measure competencies, knowledge, and skills with tests. Students are given examinations of their knowledge and graded accordingly. However, testing for adequate levels of experience, adequate amounts of relationships, and an adequate degree of situational awareness capability is problematic.

It is not known how much experience is enough to be deemed minimally prepared for disasters; how much situational awareness is enough is also unknown; equally unknown is how many relationships are enough. If such could be known, it is likely that the definition of *enough* would vary greatly by jurisdiction. Yet, training strategies have been identified that develop experience, foster relationships, and improve situational awareness capabilities.

If measuring experience, relationships, and situational awareness capabilities in EMS disaster preparedness is not practical, measuring activities likely to result in the development of these competencies, knowledge, and skills may be feasible. Measuring the supporting activities may be the most sensible approach to determining preparedness.

Woodbury presented evidence that measuring preparedness is possible and practical (Woodbury, 2005). He demonstrates through examples the ability to measure preparedness through modeling, breaking complex parts into components, and he shows examples of using outputs to measure outcomes. He states at the conclusion of his article that,

> …if we do nothing else, we need to put the argument of unmeasurable [*sic*] prevention behind us and accept that it can be quantified, at least by proxy and/or by evaluating the parts of the whole. (Woodbury, 2005)

It appears that if terrorism prevention can be measured on a national level that it can be equally as possible to measure components disaster preparedness of an EMS agency at a local level. Measuring supporting activities by proxy to evaluate levels of experience, relationships, and situational awareness capabilities is practical.

Training strategies or activities identified earlier that develop experience, foster relationships, and improve situational awareness capabilities may result in improved disaster preparedness should be further examined. The strategies offered in this research do not represent an exhaustive list of all possible methods for building the skills. It is plausible that other activities may be equally if not more effective in skill development.

The approach used above for measuring performance capability of the 10 core EMS disaster response roles is replicated here for measuring competencies and skills. The metrics are simply the activities identified earlier posed in the form of a closed-ended question. Two additional activities are listed to address preplanning and standardized incident command structure topics.

- Are all levels of LEMSA staff and volunteers exposed to experiential training sessions? Yes or No
- Does the LEMSA leverage ICS/NIMS training opportunities to build relationships? Yes or No
- Does the LEMSA provide trust-building opportunities at multi-disciplinary and multi-jurisdiction levels? Yes or No
- Does the LEMSA provide opportunities to build familiarization of individual responders through collaborative projects? Yes or No

- Do all training opportunities include rare and unexpected elements to build schemata and enhance resilience? Yes or No
- Does the LEMSA develop or participate in experiential training opportunities to enhance situational awareness skills? Yes or No
- Do all training opportunities include realistic expectations of success? Yes or No
- Do all training opportunities include the introduction of psychological impacts of a terrorist attack and how perceptions may be altered? Yes or No
- Has the LEMSA pre-planned the response for mass-casualty disasters for the likeliest threats to the jurisdiction, and are lessons learned applied to plans on ongoing basis? Yes or No
- Does the LEMSA know how to work within and use standardized incident command structure processes and manage mutual aid resources? Yes or No

The same limitations identified above in the *Measuring Performance Capability of the Ten Core EMS Disaster Response Roles* section are applicable to these measurements as well. Evaluation requires subjective self-assessment.

Appendix D contains suggested benchmarks that might be considered in evaluating a LEMSA's progress towards participating in each activity. Benchmarks help to establish a baseline or starting point to measure achievement (Bryson, 2004, pp. 281–283). The 31 benchmarks are offered as possible ways to measure the activities that lead to desirable disaster preparedness outcomes. This list is not exhaustive; there may be many other benchmarks to assist EMS agencies to enhance preparedness. Additionally, this list of benchmarks has not been tested to validate results definitively. Rather, these are offered as a starting point for jurisdictions. It is expected that use of these measures combined with future research will refine and improve the measurement process.

VIII. CONCLUSIONS

One of the problems identified early in this research project is that EMS disaster preparedness has not been clearly defined. Some vital roles are provided in the *Target Capabilities List* and the *National Response Guidelines*; clearly, some work towards defining EMS disaster preparedness has been done. Yet, there is no nationally recognized consensus on the definition of EMS disaster preparedness. Moreover, very little EMS-specific literature is available. Of the information available on the EMS discipline, most pertains to field operations. Even less information is obtainable on the administration of the EMS system or LEMSA in the support of the EMS system and support of core emergency medical operations. A gap in the literature exists for this niche sub-discipline.

In addition to a lack of consensus on defining EMS disaster preparedness, consensus also does not exist on identifying the competencies needed to perform EMS' disaster response roles. Further, no consensus has been reached on the data elements that may need to be collected to begin measuring disaster preparedness levels. Lastly, consensus does not exist in EMS on the selection of performance indicators.

Perhaps, the research conducted herein contributes in a small way to begin filling the literature gap and providing information that may lead to broadly accepted consensus on LEMSA disaster preparedness. Traditional methods of reaching consensus involve deliberately trying to solve a problem through discussions, dialogue, debate, and mutual learning. Rather than trying to build consensus on a variety of theories and moving forward towards one vision, this research used the opposite approach. The researcher attempted to discover the actual commonalities between LEMSAs to identify where consensus may already exist.

Conscious consensus may not exist. However, evidence has been uncovered through this research to indicate that LEMSAs are already doing many of the same things in regards to disaster response roles, skills, and equipment. A de facto consensus may already exist.

The Framework for LEMSA Disaster Preparedness found in Table 7-1 and Appendix B identifies areas of consensus among LEMSAs. The framework contains the 10 most common disaster response roles performed by LEMSAs. Further, it lists the two essential competencies and knowledge bases LEMSAs identified as imperative to a successful response. Three specific skills needed to perform the disaster response roles, which are common to most LEMSAs, are discovered. Another area of consensus is the six tools and equipment most useful in LEMSA disaster response activities. Together, the Framework for LEMSA Disaster Preparedness defines LEMSA disaster preparedness. The elements of this framework paint the picture of what disaster preparedness looks like. Common roles, competencies, skills, and tools needed for a LEMSA to be minimally prepared for a disaster have been discovered and compiled.

A great deal of time, energy, and money is spent in the name of disaster preparedness. Yet, no nationally accepted process is in place to evaluate EMS' level of disaster preparedness. Without the ability to measure preparedness, LEMSAs and for that matter the country, do not have a keen understanding of response capabilities. In regards to funding, without measurements, no method exists to demonstrate that the investment in preparedness is worthwhile.

Measuring disaster preparedness facilitates establishment of baselines in the level of preparedness. It is possible to determine if progress is being made in becoming better prepared by using benchmarks (Bryson, 2004, pp. 281–283). Additionally, measurements provide an element of accountability for the taxpayer and policy makers.

Part of the difficulty in measuring disaster preparedness is knowing what to measure. The findings from this research identify 10 core LEMSA disaster response roles. Determining the jurisdiction's capabilities at performing these roles will help to understand the extent to which one is prepared. As listed in Appendix C, several specific items for consideration are listed with each core LEMSA disaster response role to help assess the level of preparedness. LEMSAs that have the items or procedures in place, or some equivalent that better suits local needs, are more likely to be able to perform the core role than LEMSAs that do not. Having the ability to perform the 10 core roles increases the likelihood that a successful response can be executed.

Specific competencies, knowledge, and skills have been discovered that are essential for improving the chances for a successful LEMSA response. Again, knowing what to measure is difficult. Measuring intangibles can be problematic. Appendix D provides activities and strategies that support development of the competencies, knowledge, and skills. Implementing the strategies will create the environment that fosters development of the competencies, knowledge, and skills. Perfect implementation of the strategies does not guarantee an enhanced level of disaster preparedness. However, failure to foster development of the identified competencies, knowledge, and skills will decrease the chance for a successful response.

Several benchmarks are offered with each strategy in Appendix D. Possible ways to measure progress in activities that may improve disaster preparedness exist. The measures are offered as a starting point for jurisdictions. Testing of each benchmark should be performed to validate its usefulness and accuracy.

This thesis hypothesizes that it was possible and practical to define the skills and equipment that a LEMSA would need to perform strategic disaster response duties common to most if not all types of disasters. It was further hypothesized that it was possible to define performance indicators that could confirm that a LEMSA's preparatory actions were sufficient to fulfill its disaster response role. Through the research process, it was in fact possible to do both. LEMSA disaster preparedness was defined; the competencies, knowledge, skills, and tools needed to respond to a disaster successfully discovered; and a series of performance indicators offered to measure a LEMSA's level of disaster preparedness.

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APPENDIX A. SURVEY AND INTERVIEW QUESTIONS

Please circle or mark all functions that you or your organization performed during this disaster event.

Assessment of Immediate Medical and Health Needs

1. Activation of the Disaster Medical and Health System and notification of key positions; initiate recall to staff spare ambulances and provide immediate surge capability
2. Transformation of pre-hospital system to disaster status
3. Activate medical surge plans, procedures, and protocols
4. Establish effective, reliable interoperable communications between EMS, incident command, public health, and healthcare facilities
5. Develop situation status information and report status to appropriate channels/levels

Other_____

Coordination of Patient Distribution and Medical Evacuation

6. Coordinate triage and pre-hospital treatment operations with on-site Incident Command
7. Manage pre-hospital patient distribution and patient tracking
8. Coordinate the establishment of temporary Field Treatment Sites (FTS); designate, manage and support FTS
9. Manage facility-to-facility transfers (interfacility transfers)
10. Coordinate the evacuation from damaged or overwhelmed medical facilities
11. Activate alternative care sites and overflow emergency medical care facilities to manage hospital surge capacity
12. Coordinate evacuation of casualties to outside the area if the local capacity is exceeded
13. Coordinate receiving of casualties from other jurisdictions (providing mutual aid)

Other_____

Coordination of Disaster Medical and Health Resources

14. Maintain an EMS resource inventory for the system
15. Track use and assignments of personnel, equipment, and other non-disposable medical resources
16. Provide medical support, safety considerations, and PPE for EMS responders and hospitals
17. Assess need for additional medical resources (mutual aid)
18. Ability to acquire, allocate, mobilize and support additional resources (mutual aid)
19. Activate healthcare workers' and volunteers' call systems

20. Manage support to hospitals; ensure adequacy of medical equipment and supplies in support of immediate medical response operations and for restocking supplies/ equipment requested
21. Coordinate acquisition of private source medical supplies
22. Manage support to other health facilities; coordinate with alternative emergency medical providers (clinics, skilled nursing facilities)
23. Monitor supply usage and stockpile levels of health facilities, mass prophylaxis sites, and other critical care venues; process and manage requests for additional medical supply personnel or equipment
24. Request Strategic National Stockpile assets from Centers for Disease Control
25. Ensure the timely provision of medical supplies to shelters and mass care and medical facilities
26. Provide personnel for shelters and mass care and medical facilities
27. Implement austere medical care standards, as appropriate, to manage mass casualty events

Other_____

28. Your contact information
    Name and Title:
    Organization:
    Mailing Address:
    Phone:

29. The best time to reach you by phone over the next two weeks to conduct the interview:

Interview Questions

30. Think back to the time when you and your organization were responding to the disaster/incident and attempting to provide many if not all of the EMS roles listed above.
    a. Please describe the highpoints or moments you remember as having left you with an intense sense of pride, excitement, or involvement in having accomplished one or more of the roles listed above. As part of this description, please describe the outcomes that were achieved.
    b. Please further describe the experience;
        i. What was happening around you at the time?
        ii. Who was involved?
        iii. What made it so memorable?
    c. Further describe the experience; what specific skills, knowledge, talents, behaviors, fortune/luck, conversations, information, and other actions contributed towards your organization's success and accomplishments related to this incident?
    d. Recall as best you can the steps or sequence of events you and your organization used to accomplish the role(s) listed on the previous page.

i. What tools, equipment, utensils, gear, or other tangible resources did you use?
ii. What did you find most useful in achieving your accomplishments?
iii. What were the outcomes?

31. Imagine that you were faced with having to respond again to this kind of incident or some other disaster. Assume that the hypothetical future incident is now over and your organization performed exceeding well. Your organization has been praised by the community for its timely, competent response, and as a result of your organization's actions lives were saved and suffering reduced. Accurate initial situation and resource assessments were made and effectively communicated; ongoing situation status reports were accurate, timely, and useful; ambulance crews, medical responders, hospitals, and other medical providers received all of the support, equipment, supplies, and personal care they needed to perform their jobs at peak performance; patients were treated, transported, transferred, and tracked flawlessly at all levels; and the field treatment sites were well-supported, efficient, and provided optimum interim care.
    a. What happened to achieve this level of success (both in preparation for and during the event)?
    b. What part did you and your EMS organization play in this success?
    c. What 3 wishes do you have to help your EMS organization reach and sustain this type of success?
32. Please provide a copy of your organization's after-action report prepared for the listed event, if one is available and can be shared. If it is available online, please provide the URL.

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APPENDIX B. FRAMEWORK FOR LEMSA DISASTER PREPAREDNESS

Ten Core EMS Disaster Response Roles

1. Establishing effective, reliable interoperable communications between EMS, incident command, public health, and healthcare facilities
2. Activating the disaster medical and health system and notification of key positions; initiating recall to staff spare ambulances, and provide immediate surge capability
3. Assessing the need for additional medical resources (mutual aid)
4. The ability to acquire, allocate, mobilize, and support additional resources (mutual aid)
5. Being able to develop awareness of the situation and passing that information to others in the command chain
6. Activating medical surge plans, procedures, and protocols
7. Managing pre-hospital patient distribution and tracking
8. Tracking use and assignments of personnel, equipment, and other non-disposable medical resources
9. Transforming the pre-hospital system to disaster status
10. Maintaining an EMS resource inventory for the system

Two Essential Competencies or Knowledge Bases

- Experience –actual disaster response and/or drills and exercises
- Preplanning –mass-casualty disaster response plans of likeliest threats; applying lessons learned to plans on ongoing basis

Three Skills Needed to Perform Core Roles

- Ability to build and maintain relationships across disciplines and across jurisdictions
- Ability to work within and use standardized incident command structure processes and manage mutual aid resources
- Ability to construct accurate situational awareness

Six Tools or Equipment Most Useful in Performing Core Roles

1. Cell phone
2. Two-way radio
3. Computer, along with various Internet applications
4. Telephone
5. Call Lists
6. Geographic Information System mapping

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APPENDIX C. CONSIDERATIONS FOR ASSESSING PERFORMANCE CAPABILITIES OF THE TEN CORE LEMSA DISASTER RESPONSE ROLES

1. Can the LEMSA establish effective, reliable interoperable communications between EMS, incident command, public health, and healthcare facilities? Yes or No.

Items to consider when assessing performance capabilities:

- Multiple modes of communication equipment are available to each facility, including land line telephone; cell phone; two-way radio with common frequencies; hand-held two way radio; computer with Internet and e-mail capabilities; specialized common software for gathering and sharing resource and status information; back-up telephone infrastructure, e.g. microwave link with back-up T-1 connection; satellite phones; and access to HAM radio operators
- Central dispatch operations for responding agencies that can facilitate channel assignments for each discipline or tactical group
- Cable and airwave television
- A comprehensive communications plan for the jurisdiction and region

2. Can the LEMSA activate the disaster medical and health system and notification of key positions; initiating recall to staff spare ambulances, and provide immediate surge capability? Yes or No.

Items to consider when assessing performance capabilities:

- Accurate call lists of all key positions, personnel, and facilities
- A plan with established criteria for knowing when to activate the disaster medical and health system
- A system-wide surge protocol or policy
- A plan, mechanism, or procedure to alert medical and healthcare facilities to initiate the surge protocol

3. Can the LEMSA assess the need for additional medical resources (mutual aid)? Yes or No.

Items to consider when assessing performance capabilities:

- Ability to construct accurate situational awareness; number and extent of injuries from the event and real-time the bed capacity within the system
- Understanding capabilities and needs of the local EMS system and hospital capacity
- Ability to anticipate short-term future needs of EMS system providers

4. **Does the LEMSA have the ability to acquire, allocate, mobilize, and support additional resources (mutual aid)? Yes or No.**

Items to consider when assessing performance capabilities:

- Understanding and working knowledge of the ICS/NIMS concepts
- Pre-event identification of possible mutual aid resources
- Procedures for activating and requesting mutual aid, including knowledge of resource typing standards
- Availability of logistical support personnel

5. **Does the LEMSA possess the skills to develop awareness of the situation and pass that information to others in the command chain? Yes or No.**

Items to consider when assessing performance capabilities:

- Possession of strong situational awareness skills
- Understanding and working knowledge of the ICS/NIMS concepts
- Availability of all tools and equipment listed in the Framework for LEMSA Preparedness

6. **Does the LEMSA have procedures and protocols in place for activating medical surge plans? Yes or No.**

Items to consider when assessing performance capabilities:

- Existence of a surge plan and mass-casualty plan
- Knowledge of plan concepts and the specific procedures
- Ability to execute procedures

7. **Can the LEMSA manage pre-hospital patient distribution and tracking? Yes or No.**

Items to consider when assessing performance capabilities:

- Determine how and by who this will be accomplished
- Ensure infrastructure and equipment is in place to accomplish role
- Redundant or alternate system is in place if primary technology fails during the event

8. **Can the LEMSA track use and assignments of personnel, equipment, and other non-disposable medical resources? Yes or No.**

Items to consider when assessing performance capabilities:

- Determine how and by who this will be accomplished
- Ensure infrastructure and equipment is in place to accomplish role
- Redundant or alternate system is in place if primary technology fails during the event
- Understanding and working knowledge of the ICS/NIMS concepts

9. Can the LEMSA transform the pre-hospital system to disaster status? Yes or No.

Items to consider when assessing performance capabilities:

- Existence of a plan, standards, or criteria that can aid in decision making to transition the system
- Existence of disaster operation standards or protocols for dispatch, pre-hospital response, field treatment, austere care standards
- Process to notify all EMS system providers of transition
- Working knowledge of disaster operation standards or protocols by all EMS system personnel

10. Does the LEMSA maintain an EMS resource inventory for the system? Yes or No.

Items to consider when assessing performance capabilities:

- Call lists
- Number and types of ambulances
- Other types of transportation equipment available, e.g. buses, wheelchair vans
- Number of paramedics and EMTs
- Number of licensed beds at each medical facility
- Number of surge beds available at each facility
- Number and location of disaster supply items available, e.g. surge tents, hand-held radios, mass-casualty triage kits, medical supplies and so on

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APPENDIX D. MEASURING COMPETENCIES AND SKILLS

Are all levels of LEMSA staff and volunteers exposed to experiential training sessions? Yes or No

- Percentage of LEMSA staff fully participates in experiential disaster training opportunities, including table tops, and functional exercises
- Percentage of LEMSA volunteers fully participate in experiential disaster training opportunities including table tops, and functional exercises

Does the LEMSA leverage ICS/NIMS training opportunities to build relationships? Yes or No

- LEMSA has identified the organizations that are likely to be first-responders to a local disaster
- LEMSA has identified the organizations that are likely to provide mutual aid during a local disaster
- Percentage of ICS/NIMS training opportunities that include joint participation by the likely first-responder organizations and mutual aid providers

Does the LEMSA provide trust-building opportunities at multi-disciplinary and multi-jurisdiction levels? Yes or No

- Numbers of meetings annually in which LEMSA staff members interact with other response, medical-health, and other support disciplines
- Numbers of meetings annually in which LEMSA staff members interact with other response, medical-health, and other support disciplines from probable mutual aid jurisdictions
- Numbers of drills and exercises annually in which LEMSA staff members fully participate and engage other response, medical-health, and other support disciplines
- Numbers of drills and exercises annually in which LEMSA staff members fully participate and engage other response, medical-health, and other support disciplines from probable mutual aid jurisdictions

Does the LEMSA provide opportunities to build familiarization of individual responders through collaborative projects? Yes or No

- Numbers of projects, committees, or task forces annually in which LEMSA staff members have the opportunity to interact with individuals of response, medical-health, and other support disciplines
- Numbers of projects, committees, or task forces annually in which LEMSA staff members have the opportunity to interact with individuals of response, medical-health, and other support disciplines from probable mutual aid jurisdictions

- Numbers of activities annually, including informal social activities, in which LEMSA staff members have the opportunity to interact with individuals of response, medical-health, and other support disciplines
- Numbers of activities annually, including informal social activities, in which LEMSA staff members have the opportunity to interact with individuals of response, medical-health, and other support disciplines from probable mutual aid jurisdictions

Do all training opportunities include rare and unexpected elements to build schemata and enhance resilience? Yes or No

- Percentage annually of training events, drills, and exercises that include rare or unexpected circumstance(s)
- Number of other opportunities annually in which LEMSA staff members must cope with rare or unexpected circumstances
- Number of formal events, meetings, drills, etc. in which LEMSA staff members have the opportunity to debrief and engage others at the conclusion or following the event

Does the LEMSA develop or participate in experiential training opportunities to enhance situational awareness skills? Yes or No

- Develop a list of atypical demands LEMSA staff members may possibly encounter during a response; continually update list as needed
- Percentage of training sessions annually involving LEMSA staff members in which atypical demands were incorporated into the scenario and in which opportunities for group dialogue were conducted for addressing the atypical demand

Do all training opportunities include realistic expectations of success? Yes or No

- Identify actual outcomes from past disastrous or multi-casualty events; educate all LEMSA staff on past event outcomes
- Percentage of training events in which LEMSA staff members had the ability to examine and analyze response constraints and identify the root cause of the constraint
- Percentage of event debriefings annually in which LEMSA staff members participated/attended and then analyzed the data to determine strengths and weaknesses of the response

Do all training opportunities include the introduction of psychological impacts of a terrorist attack and how perceptions may be altered? Yes or No

- Number of times annually in which formal training addresses the concept that people will strive to alter the meanings of an attack or disastrous event in order to reduce the negative impacts in their mind

- Percentage of formal multi-discipline debriefings held annually following significant multi-casualty events
- Percentage of such debriefings in which a list of lessons learned were developed and in which response procedures were changed/improved based on the lessons

Has the LEMSA pre-planned the response for mass-casualty disasters for the likeliest threats to the jurisdiction, and are lessons learned applied to plans on ongoing basis? Yes or No

- Identify the realistic threats to the jurisdiction, which will involve an EMS response
- Percentage of EMS response plans prepared for the realistic threats
- Percentage of LEMSA staff members that have demonstrated knowledge of and ability to implement the plans

Does the LEMSA know how to work within and use standardized incident command structure processes and manage mutual aid resources? Yes or No

- Percentage of LEMSA staff members who have completed the ICS 100, 200, 700, 800, 300, and 400 training and any other NIMS-related courses required by the jurisdiction
- Percentage of LEMSA staff members that have demonstrated the ability to request and provide mutual aid resources through prescribed procedures
- Number of times annually LEMSA staff members have used and applied the ICS structure in working with groups
- Number of times annually LEMSA staff members have worked within the ICS structure in an actual response effort

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